ENERGY MANAGEMENT SOFTWARE

POWERSTUDIO

(Standard, SCADA, Deluxe)

Version 3.4

USER MANUAL 2 / 4

(M98232201-03-12B)

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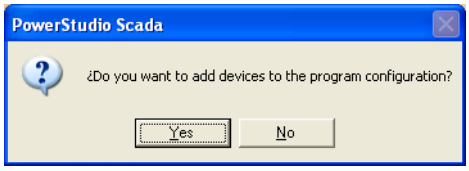
1 Running the Program for the First Time

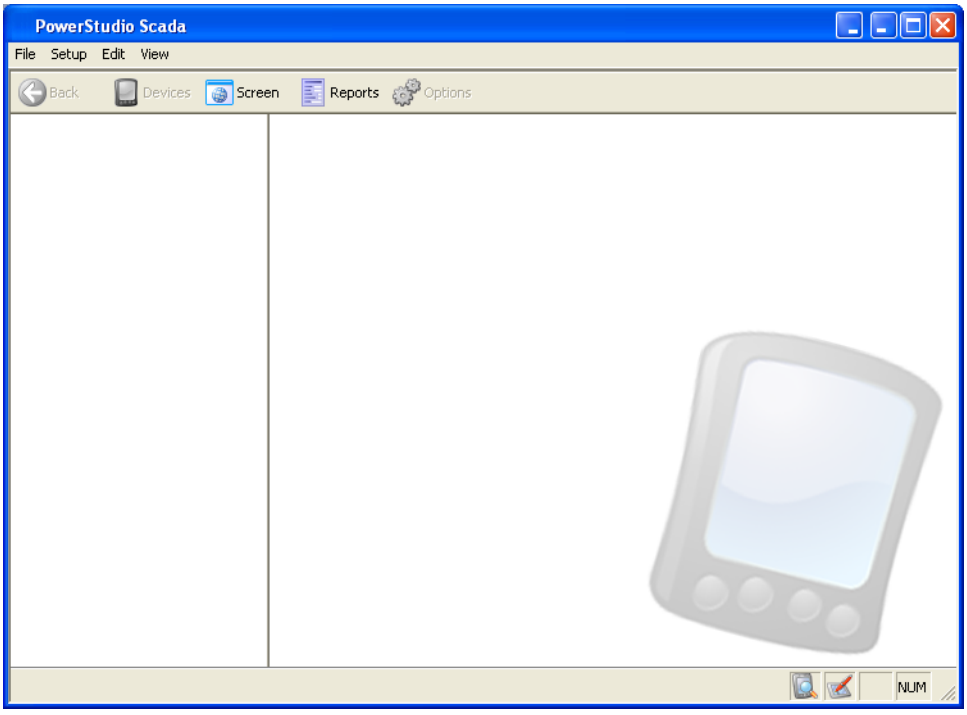
When running for the first time the program will ask if you want to add devices.



By selecting '*Yes*', you can proceed to add devices as explained further on in the 1.1.1 Devices section.

When the device is added, you will be asked if you want to add any more devices.

If '*Yes*' is chosen then a new device will be added, otherwise, the program will start as normal.

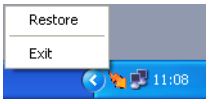


The program consists of three distinct areas:

The main menu: Situated at the top. Accesses all program functions.
Button bar: Just below the main menu. Provides fast access to the most frequently used functions.
Main display: Occupies the rest of the available space and contains the current active view.

N.B. Once this has been configured and the installation is running, it can and should be minimized using the button to the left of the four buttons on the top right-hand corner of the window. The program will then only be shown as an icon in the shape of a small orange arrow on the right hand side of the toolbar (where the time and other programs such as anti-virus etc. can normally be found

which run in the background on the machine).



This will prevent its being permanently visible on screen, as well as its accidental closure and the temptation of other users to use it.

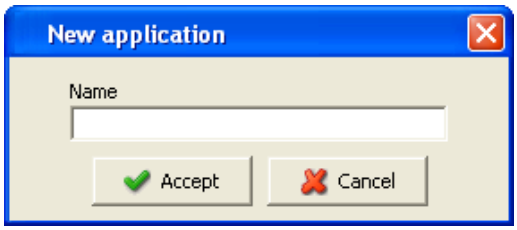
To return to PowerStudio again, double click on the icon or select the “*Restore*” option from the context menu available by right clicking on the icon.

In addition to the "*Restore*” option the “*Exit*” option also appears on the context menu. Use this option to leave the program outright.

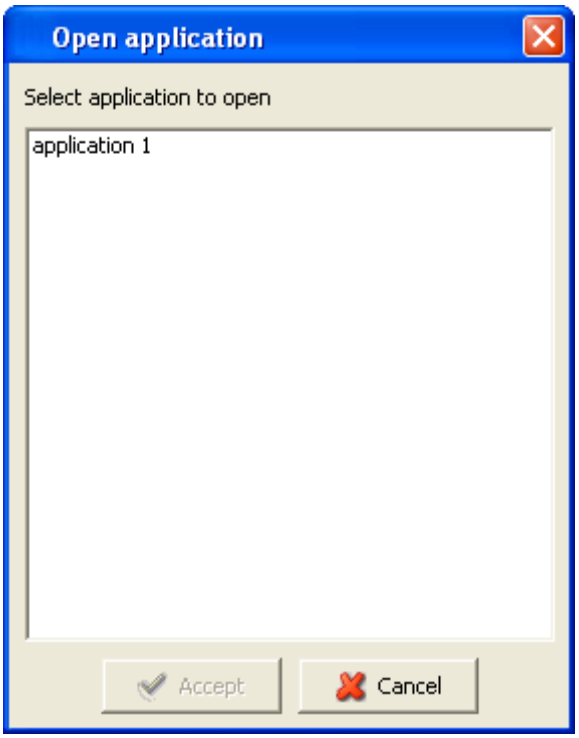
2 Menu Bar

2.1 File Menu

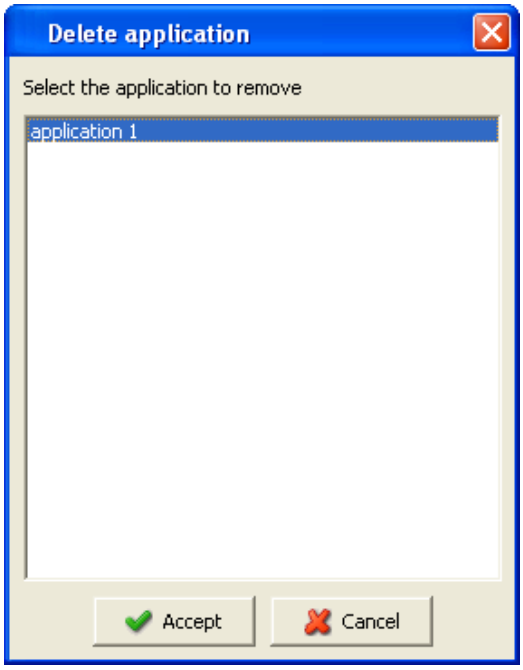
'New: This option allows you to create a new application and edit it.



'Open': Use this option to open any existing application for editing.



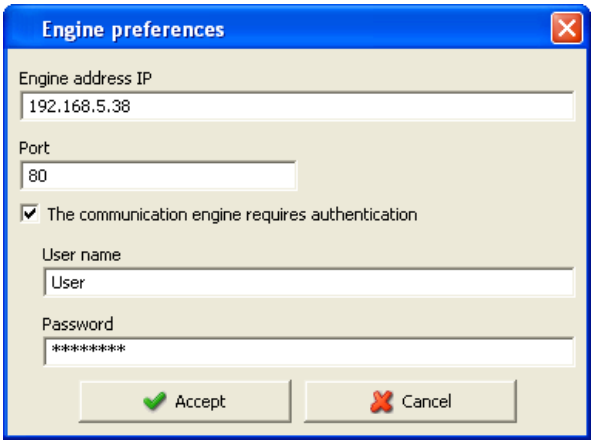
'Remove': This option deletes any existing application.



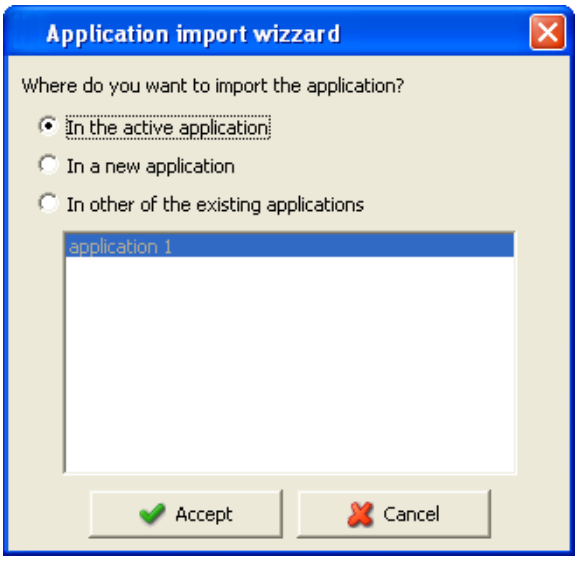
'Modify': Use this option to change the name of the application being edited.

'Save as': Use this option to make a copy of the application being edited and assign it another name.

'Engine preferences': This option configures the address and port of the communications engine. You may also indicate user and password if authentication is required. These parameters are used to import/export the application.



'Import': Allows configuration of the communications engine to be imported for subsequent modification.



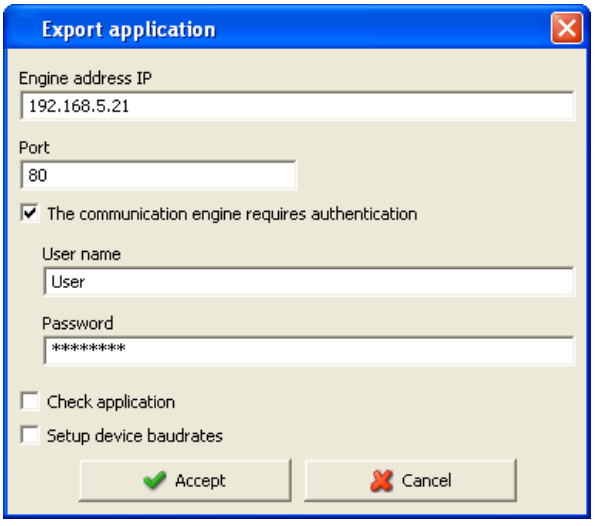
You may Import:

- The active application: The engine configuration is imported into the active application. The contents of the active application are overwritten.

- A new application: The engine configuration is imported into a new application. The name of the new application will be requested.

- Another of the existing applications. The engine configuration is imported into an existing application. The contents of the selected application are overwritten.

Export: Exports the active application to a communications engine.



The default options are shown in 'Engine preferences', but can be modified to send the application to any other communications engine. If the 'Verify application' option is selected before export the application is verified to be correct or invalid elements are reported. If the 'Configure communication speeds with the devices' option is selected, it will try to communicate with the devices before sending the application and display a summary of the devices it could not communicate with.

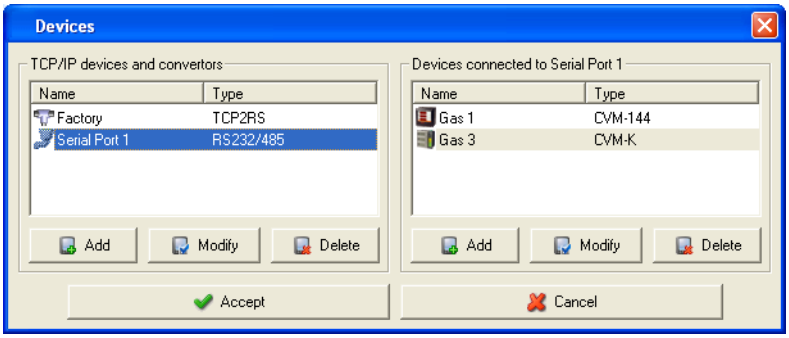
'Exit': Terminates the program.

2.2 Set up menu

The main software parameters can be configured using this menu.

2.2.1 Devices

Clicking on this option will bring up the following dialogue:

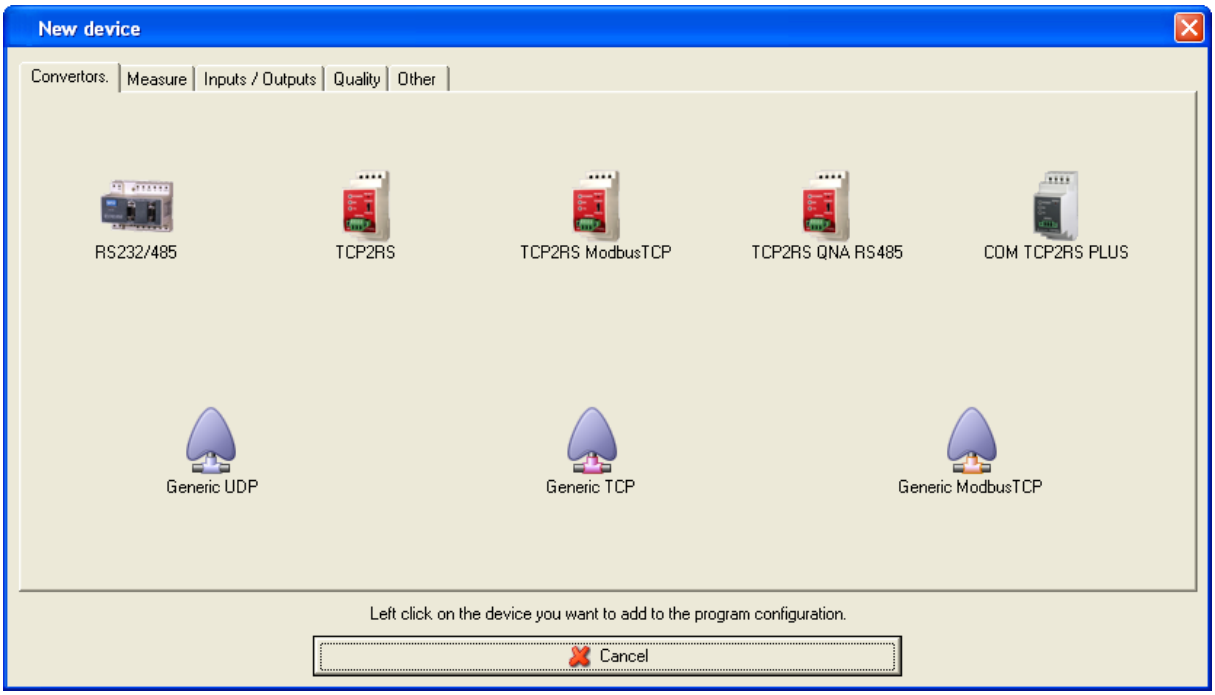


Here a list with configured devices can be seen, laid out just as they are physically connected.

2.2.1.3 On clicking the *'Accept'* button the software will try to configure, on those converters and devices that can be configured, the communication speeds configured in the corresponding advanced configuration window, see section 2.2.1.3 Advanced Configuration of Devices.

Devices have been classified into those which have a direct connection and converters and those devices which must be connected to others so that the software can connect with them. The former appear on the list at the left of the dialogue, and will be called first-level devices from now on, the second type can be found on the right, and from now on will be termed second-level devices.

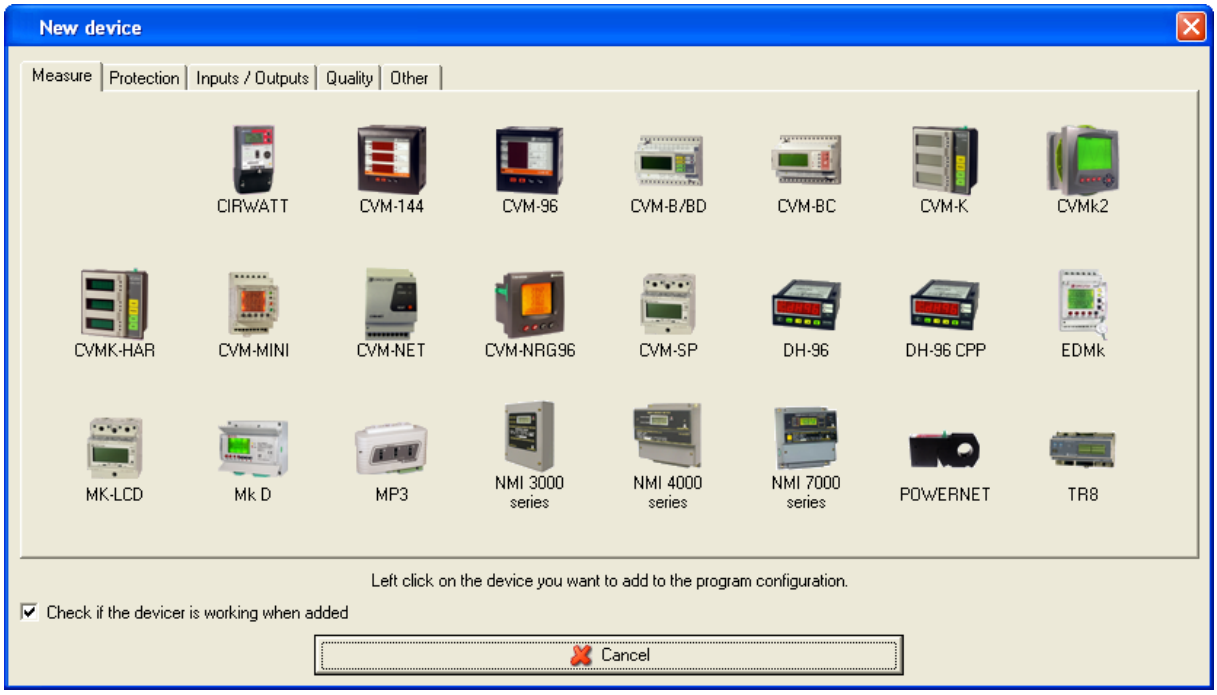
Click "*Add*" and the following dialogue box will appear to the left:



From here the device we wish to add can be selected. As stated earlier, only devices with direct network or RS232 connections, and communication converters appear in this dialogue.

Remember that deleting a first-level device will also delete any second-level devices connected to it..

Once the first-level device has been selected, the devices connected to it may be added by clicking on the '*Add*' button to the right of the dialogue. In this case only those devices which can be connected to a first-level device appear in the dialogue selection.



The *'Check device operation when added'* options tells the software to verify the connection and send an error message if the device is not working correctly or is absent. Deselect this option f a check is not required, either because the device has not been installed yet or for any other reason.

Communication may not be possible while adding or modifying devices whose communication speed varies from the connection, but this will be resolved once the software finalizes the speed configuration process.

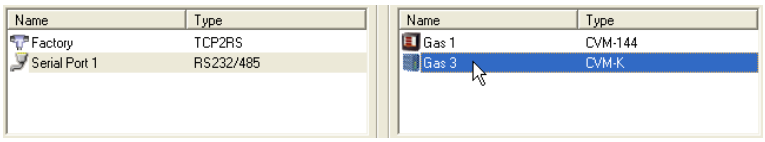
Below is a table showing the possible combinations between different devices, with first-level devices shown in the columns and the possible second-level devices that can be connected to them in the rows.

	RS232/485	TCP2RS	TCP2RS Modbus TCP	TCP2RS QNA RS485	LM50-TCP	LM50-TCP Modbus TCP	TCP50-Alarm	Generic UDP [3]	Generic TCP [3]	Generis ModubsTCP [3]
C-14d	X	X	X				X	X	X	X
CBS-4	X	X	X		X	X	X	X	X	X
CBS-8	X	X	X		X	X	X	X	X	X
CDR-8	X	X	X		X	X	X	X	X	X
CIRWATT	X	X	X[1]		X	X[1]	X[1]	X	X	X[1]
COMPUTER PLUS	X	X	X		X	X	X	X	X	X
CVM-144	X	X	X		X	X	X	X	X	X
CVM-96	X	X	X		X	X	X	X	X	X
CVM-B/BD	X	X	X[2]		X	X[2]	X[2]	X	X	X[2]
CVM-BC	X	X	X		X	X	X	X	X	X
CVM-K	X	X	X[2]		X	X[2]	X[2]	X	X	X[2]
CVM-K2	X	X	X		X	X	X	X	X	X
CVM-K HAR	X	X	X[2]		X	X[2]	X[2]	X	X	X[2]
CVM-MINI	X	X	X		X	X	X	X	X	X
CVM-NET	X	X	X		X	X	X	X	X	X
CVM-NRG96	X	X	X		X	X	X	X	X	X
CVM-R8	X	X						X	X	
CVM-SP	X	X	X		X	X	X	X	X	X
DH-96	X	X	X		X	X	X	X	X	X
EDMk	X	X	X		X	X	X	X	X	X
Generic MODBUS	X	X	X		X	X	X	X	X	X
LM-24	X	X	X				X	X	X	X
LM-4	X	X	X		X	X	X	X	X	X
MK-LCD	X	X	X				X	X	X	X
Mk D	X	X	X		X	X	X	X	X	X
POWERNET	X	X	X		X	X	X	X	X	X
QNA-412	X			X				X	X	
QNA-413	X			X				X	X	
QNA-PT	X			X				X	X	
RGU-10	X	X	X		X	X	X	X	X	X
RRM-C	X	X	X		X	X	X	X	X	X
TR8	X	X	X		X	X	X	X	X	X

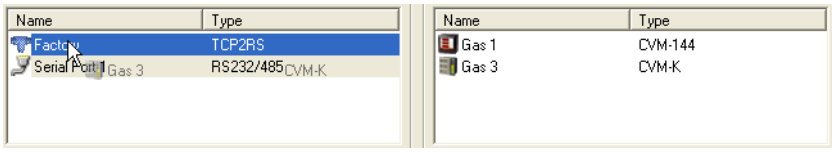
[1] Downloading data using IEC 870-5-102 with Modbus TCP protocol is not recommended.
[2] Restricted to reading values. Configuration is not possible.
[3] Depending on the generic converter used, communication errors may be produced with other devices. To learn how to configure the generic converters see the corresponding manual.

Second-level devices may be moved between first-level devices as follows:

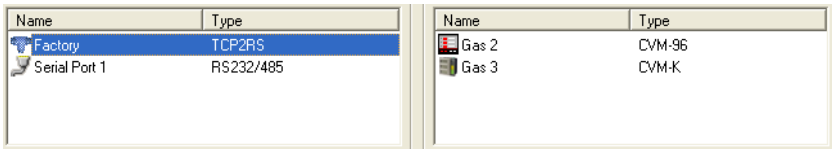
Left click to select desired devices.



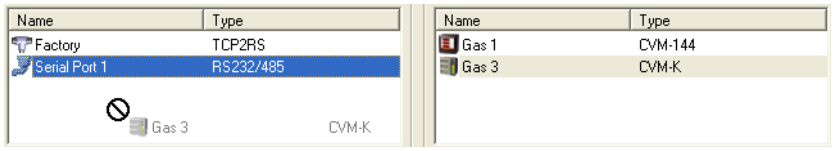
Without releasing the left mouse button, drag the cursor to the desired first level device



Release the mouse button to effect the change.

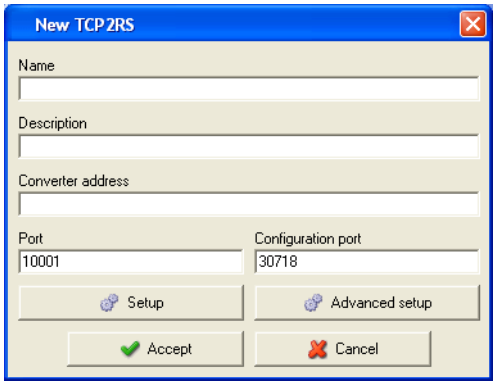


The cursor will change to if the operation is not possible because communication is not permitted, or second-level devices cannot be connected, or there is an inconsistency between devices.



2.2.1.1 Adding a First-level Device

The device screen can vary depending on the device type being added. The typical first-level device configuration screen is displayed below, however depending on the device you want to add some parameters do not exist or specific parameters for the device should be configured. The special parameters for each first-level device will be dealt with in detail in the section dealing with the device.



Where:

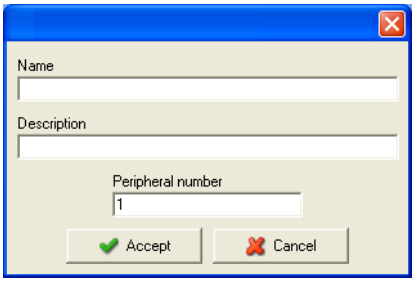
- **Name:** Alphanumeric field that uniquely identifies the device throughout the program. There are no two devices in the configuration with the same name.
- **Description:** Enter a brief description of the device using alphanumeric type data.
- **Converter address:** Corresponds to the address the program uses to communicate with the device. This parameter can be an IP address or a name.This address should not be confused with the MAC address.
- **Port:** Corresponds to the communication port.
- **Configuration port:** Corresponds to the port the program uses to configure device communications.

- **Parameters:** General communication parameters configuration.
- **Advanced Configuration:** Advanced device configuration. See section 2.2.1.3 .

Depending on the device added there may be more or fewer parameters. For more information see the section on the corresponding device.

2.2.1.2 Adding a Second-level Device

The configuration of second-level devices will be easier because communication configuration is not required. Second-level devices communicate with the program through the first-level devices they are connected to.

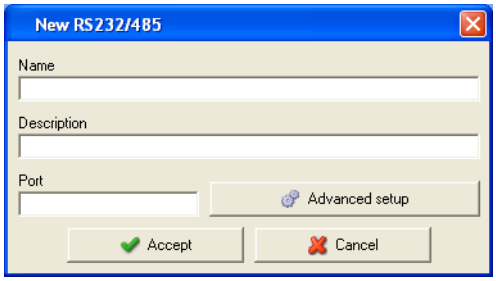


Where

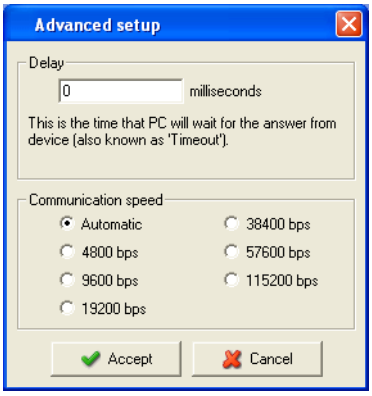
- **Name:** Alphanumeric field that uniquely identifies the device throughout the program. There are no two devices in the configuration with the same name.
- **Description:** Alphanumeric type data to enter a brief description of the device.
- **Peripheral Number:** Number identifying the device in communications. Two second-level devices connected to the same first-level device may not have the same peripheral number.

2.2.1.3 Advanced Configuration of Devices

On devices with direct connection features, such as converters, the configuration of certain communication aspects will be possible. Below is the configuration dialogue of device RS232/485 showing the button used to configure these parameters.



Clicking the *'Advanced setup"* button enables the configuration of these additional parameters.



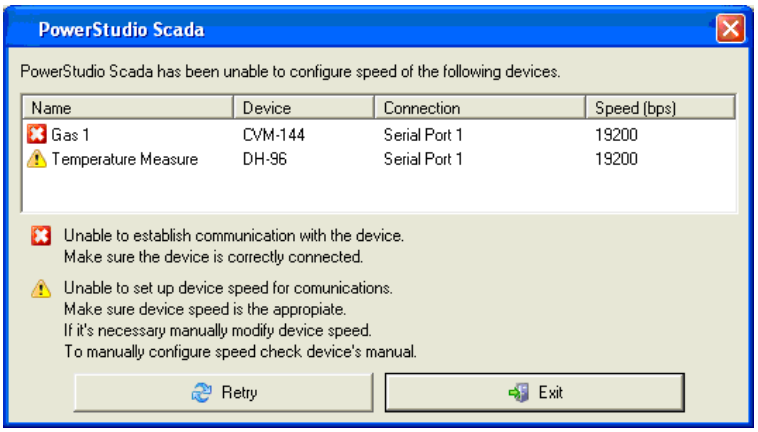
Depending on the device being configured, some of these parameters may not appear.

- **Delay:** Value in milliseconds. This value known as "Timeout" is used to control the time that software will await the response from a device. The value entered will be added to the default waiting time for a response from the device.

- **Speed of Communication:** Allows communication speed between the software and the device to be selected. This speed is automatically assigned by default, but it may also be forced to the desired speed. "Automatic" means the software configure the devices using the maximum speed common to them all. If specific speed is selected, the software will configure the devices at this speed, and devices unable to communicate at that speed no longer communicate.

Speeds are configured to accept changes in the device screen (see 2.2.1 Devices section)

Once speeds are configured, if there have been any problems the following dialogue will appear.



Devices not configured due to unmatched speeds are shown here. There are two types of warnings

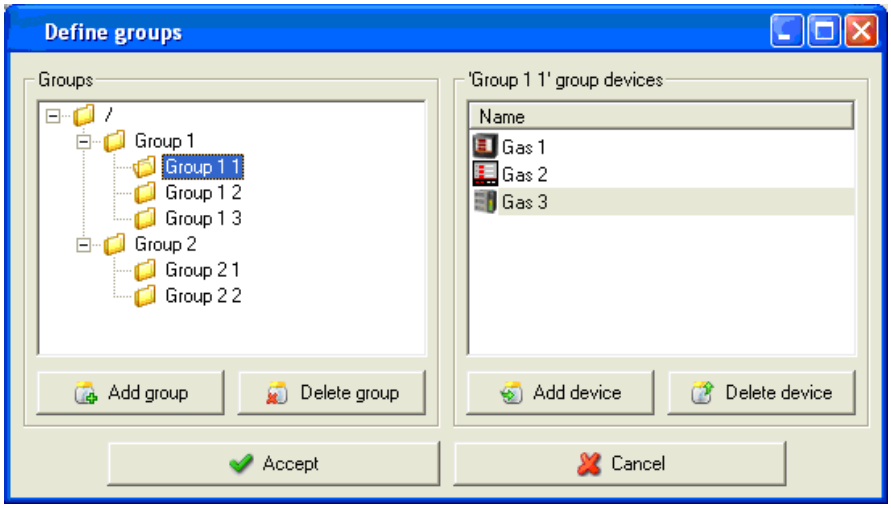
- when there have been errors in communication with the device. Once the problems have been resolved speed configuration can be attempted once more by clicking the '*Re-try* ' button.

- When the characteristics of the device make it impossible to change its speed by communication.

The user is responsible for manually configuring the proper speed on those devices where it is not possible to configure the speed by communication. To learn how to change the speeds on the devices, consult the corresponding manual.

2.2.2 Groups of Devices

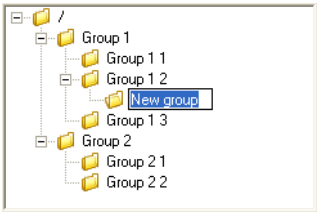
Using this option, devices can be grouped together. It is possible to have the same device in different groups; likewise groups can also be grouped.



The left part of the dialogue corresponds to the defined groups. The tree structure (with son and father nodes) will facilitate the display of dependency between groups.

/ This is the root group of the tree. When new devices are added, these are added automatically to this root group.

Add group Clicking will add the group as son of the selected group (father). You need only enter the name of the new group created.

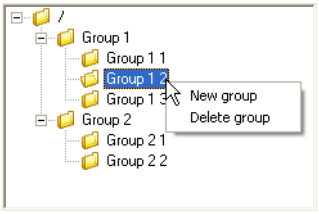


It may be changed later simply by left clicking on the name of the group.

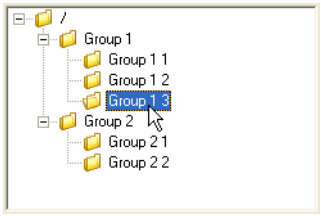
Within the same father group the names of son groups cannot be repeated, but it is possible to repeat the names of the father groups.

Delete group Clicking will delete the selected group, as well as all the son groups. It is possible to delete any group except / (root group).

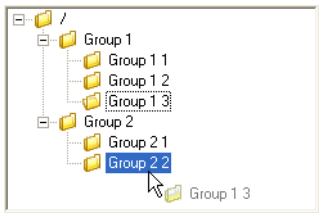
It is also possible to add or delete groups by right clicking on the node you want to add or delete. Clicking will bring up the corresponding menu to select the desired action.



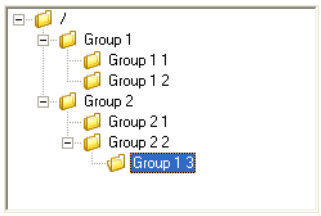
Lastly, it is possible to move or copy a group. Left click on the group you want to move or copy.



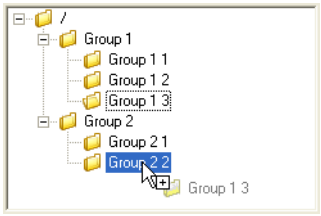
Without releasing the mouse button, drag the group to the destination father group.



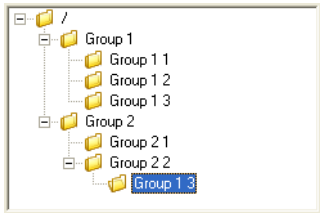
Release the mouse button for the change to take place.



If you want to copy the group, click the CTRL button and without releasing the left mouse button, the cursor will change to indicating that a copy will be made of the group.



Release the left mouse button to make a copy of the group.



If you try to drag a group which is not possible to copy or move, the cursor will change to to indicate that the action is not allowed.

The right part of the dialogue is formed by the device list that belongs to the group selected from the tree.

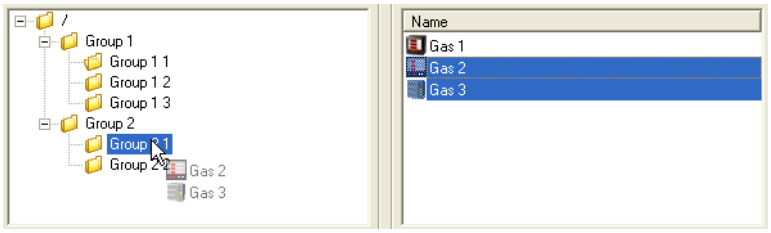
For easier identification the name of the group is indicated in the list description 'Group 1 1' group devices

Clicking the button will bring up the following dialogue box:

Here a list of configured devices which do not belong to the group will appear. Click on the "*Accept*" button and the devices selected from the list will be added to the group.

Likewise, once the devices have been added to a group it will be possible to change them easily to another group or copy them by selecting them and then left clicking.

Without releasing the mouse button, drag to the target group.



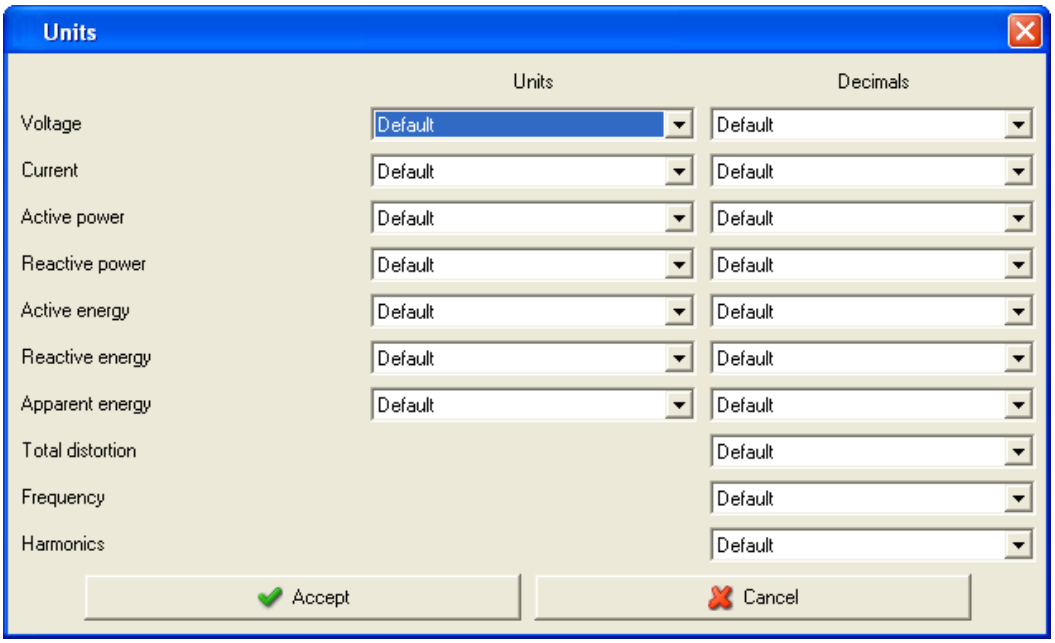
Release the mouse button for the change to take place.

If you want to copy devices to another group, proceed in the same manner as with the group copy, clicking the CTRL key before releasing the left mouse button.

This will only be active if there are devices selected from the device list. On clicking the button the devices selected will be deleted from the corresponding group.

2.2.3 Units.

Allows the default units and decimals of the variables to be configured.



2.2.4 Filters

Enables filters to be added, modified or deleted.

Filter configuration will be explained at length in chapter 4 Filters of this manual.

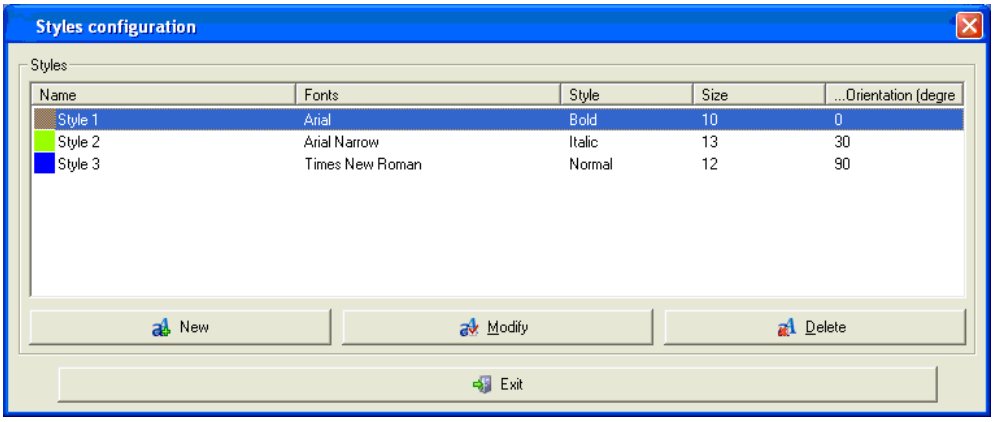
2.2.5 Calculated variables

Allows calculated variables to be added, changed or deleted.

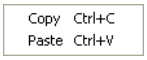
The configuration of calculated variables will be explained at length in chapter 5 Calculated variables.

2.2.6 Styles

This option can be used to add, modify or delete font styles used to show the values on the different SCADA screens and reports. Each one of the styles comprises a color and a font format.

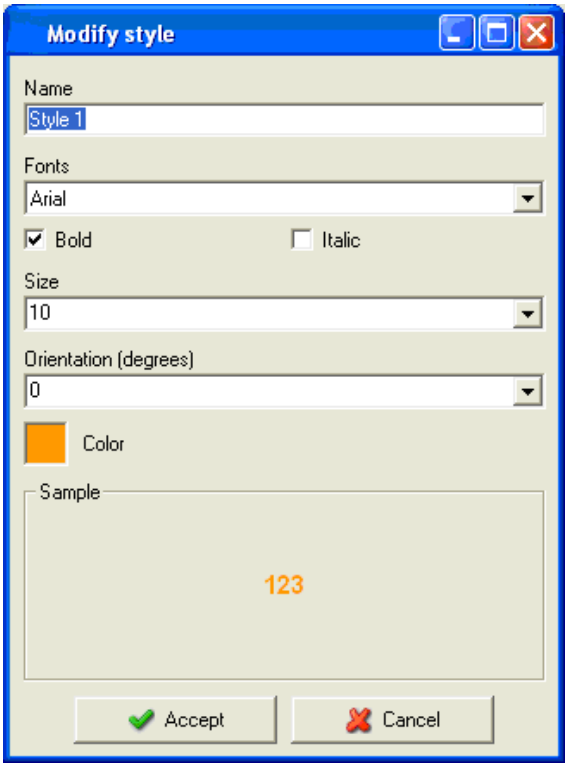


Right click the style list ad the following contextual message will appear.



This will enable styles to be pasted and copied. Some of the options from the context menu may not appear. Copy will only appear if there is a style selected, and the paste option only if the styles have been copied onto the clipboard. If no style is selected or there are no styles on the clipboard, when the right button is pushed the context menu will not appear.

Press the '*New*' or '*Modify*' button and it will be possible to add or modify a style.



Corresponds to the name of the style. This name will uniquely identify the style; there are no two styles with the same name.

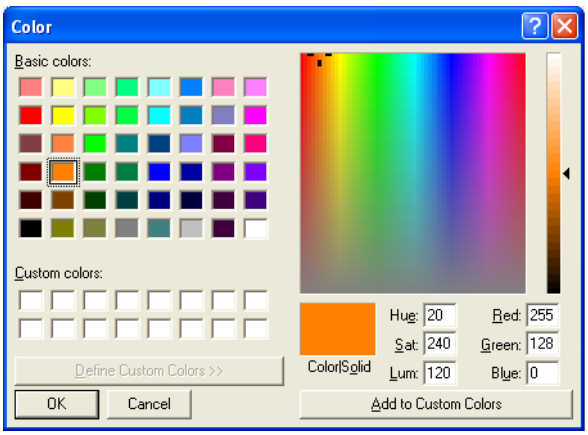
Will correspond to the type of font used for the style.

Corresponds to the style of the font. Depending on the font selected, you can choose bold and / or italics.

Corresponds to the size of the font. The size may be between 1 and 90. The size can be either keyed in or selected from the dropdown menu which shows the options available.

Corresponds to the text direction. The orientation (expressed in degrees) could be between 0 and 350. The size can be either keyed in or selected from the dropdown menu which shows the options available.

Click the button to select the style color.

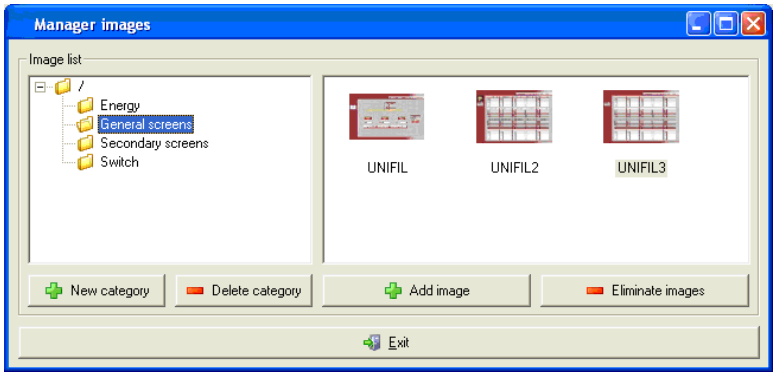


Shows an example of how the style will appear.

The '*Delete*' button will only be active if there are styles selected from the style list. Click the button to delete the styles selected.

2.2.7 Image manager

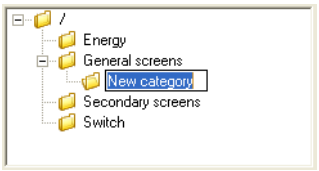
Use this option to add, modify or delete images created for a SCADA screen or a report. Images are organized in the form of a tree, and can be classified into three different categories to be chosen by the user.



The left side of the dialogue corresponds to the categories defined. The representation in tree form (with son and father nodes) facilitates display of the dependency between categories.

/ This will be the root group of the tree. When adding new images, they are automatically added to this root group.

New category Click here to add a son to the selected group (father). Then enter the group name into the new node created.

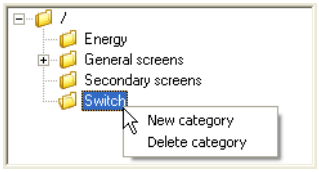


To change the group name, select the group and left click on its name.

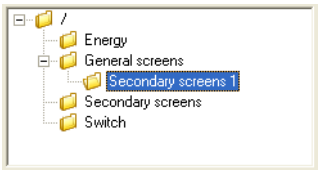
Within the same father group the names of the sons cannot be repeated, but it is possible to repeat the names of groups in different father groups.

Delete category Click this to delete the selected group as well as all its sons. It is possible to delete any group except the / (root group).

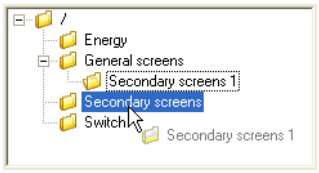
It is also possible to add or delete groups by right clicking on the node you want to add or delete. Clicking will bring up the corresponding menu to select the desired action.



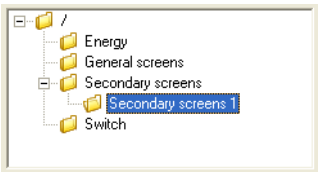
Lastly, it is possible to move or copy a particular group. Left click the group you want to move or copy.



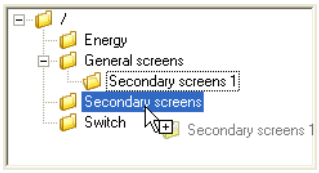
Without releasing the mouse button, drag to the destination group.



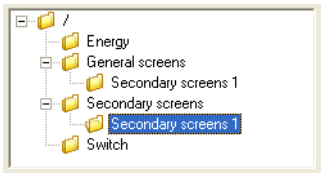
Release the mouse button for the change to take place.



To copy the group, click the CTRL button and without releasing the left mouse button, the cursor will change to indicating the group will be copied.



Release the left mouse button to make a copy of the group.



If you want to drag a group where it is not possible to copy or move it, the cursor will change to to indicate that the action is not permitted.

The right side of the dialogue is formed by a list of images which belong to the group selected from the tree.

Clicking here will bring up a dialogue that allows you to select an image stored on the PC for later use in SCADA screens or reports. PowerStudio will create a copy of the image and will work with the copy, at no time will PowerStudio use the original image selected.

The images that can be added should have a maximum size of 2 Mbytes and a maximum resolution of 2048x2048 pixels. Remember that when larger images are added, the load times from the SCADA screens or reports client, also increase.

Likewise, once images have been added to a group they can be easily copied or changed, by left clicking on one of those selected.

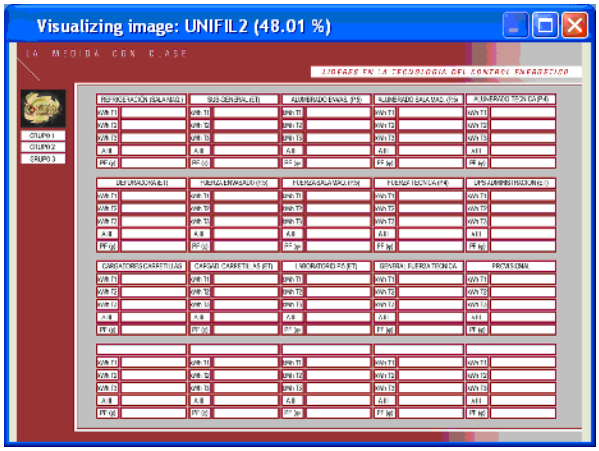
Without releasing the left mouse button, drag to the destination group.

Finally, release the left mouse button for the change to take place.

If you want to copy images in another group proceed in the same manner as with the group copy by pressing CTRL before releasing the left mouse button.

When clicked the selected image will be automatically removed. PowerStudio will delete the copy created and will not delete the original stored on the PC.

Display the image by double clicking on it:



2.2.8 Reports

Use this option to add, modify or delete reports (only en SCADA and Deluxe versions). This section will be explained in more detail in Chapter 6.

2.2.9 Screens

Use this option to add, modify or delete the different screens that make up SCADA (only in SCADA and Deluxe versions). This section will be explained in more detail in Chapter 7.

2.2.10 Events timetables

Use this option to configure event disabling timetables. This section will be explained in more detail in Chapter 9.

2.2.11 Events groups

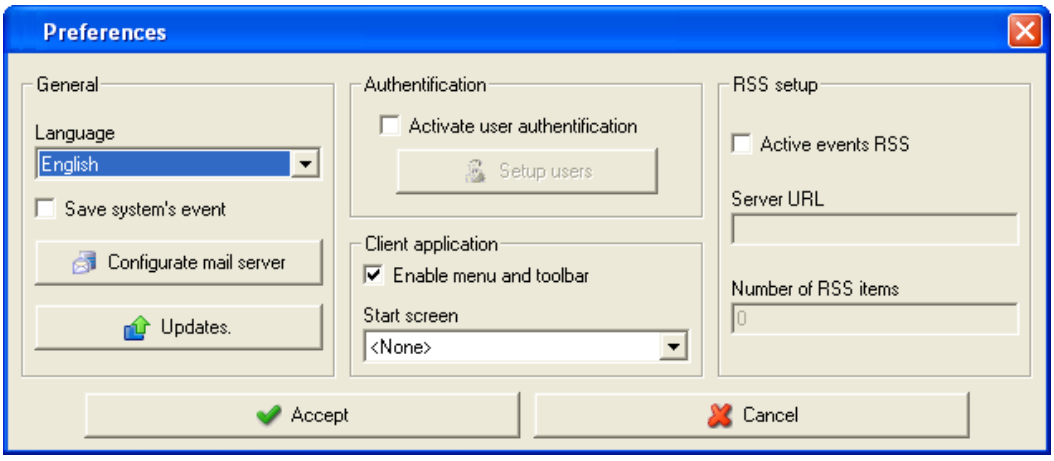
Use this option to configure events grouping. This section will be explained in more detail in Chapter 9.

2.2.12 Events

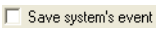
Use this option to configure a series of events in the software, configure an event disable timetable, or carry out a series of actions when the event comes about, while it is active and when the event finishes (only in SCADA and Deluxe versions). This section will be explained in more detail in Chapter 9.

2.2.13 Preferences

This option can be used to configure a series of general parameters for the application.

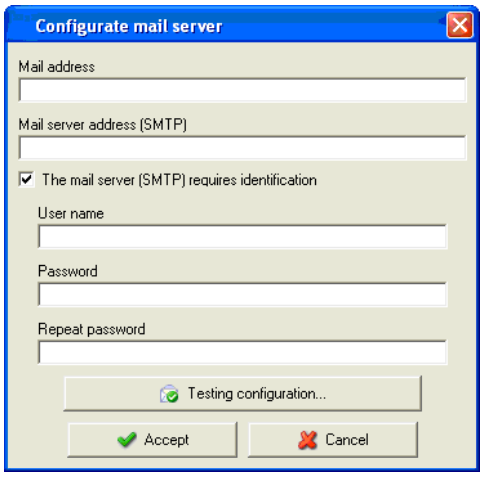


Using this selector, the application language can be selected



Will indicate to the software if an events log should be saved or not. To save system events, a table, with the various activities taking place in the system can be displayed, such as when a user accesses a SCADA screen or is denied access.

Allows the mail server to be configured to make it possible to send e-mails during events (see section 9.3.2.3 Sending Mail)

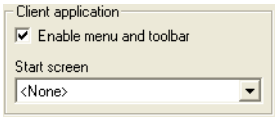


Here the '*E-mail address*' of the sender,' and the *Mail server address* (SMTP) 'should be indicated and the mail server authentication enabled if necessary.Once configured it is possible to test whether the configuration is correct by pressing the '*Test configuration…*' button, which sends and email to the sender or displays an error message.

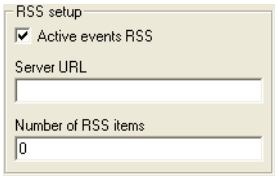
Contact your system administrator for the parameters need to configure the mail server.

Using this option software property updates can be easily made. This preference will be explained in more detail in section 2.2.13.1 Updates.

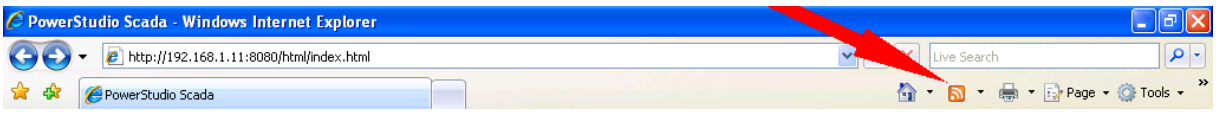
Similarly, using *'Activate User Authentication'*, the name and password of the user trying to access on a remote PC can be requested, in order to allow access to some of the resources of the application and deny access to the rest of the resources. The '*Configure users*' button will allow the resources that each one of authorized users can access to be configured. User configuration will be explained in detail in section 2.2.13.2.2 Users. If the '*Save system events*' option is enabled, user actions will be saved, whether they have been granted access to the resource or if they have been denied it.



Permits the menu display and toolbar on the Java Client to be enabled or disabled . It also enables initial screen setup when the application is displayed through the Java Client (only in SCADA and Deluxe versions).

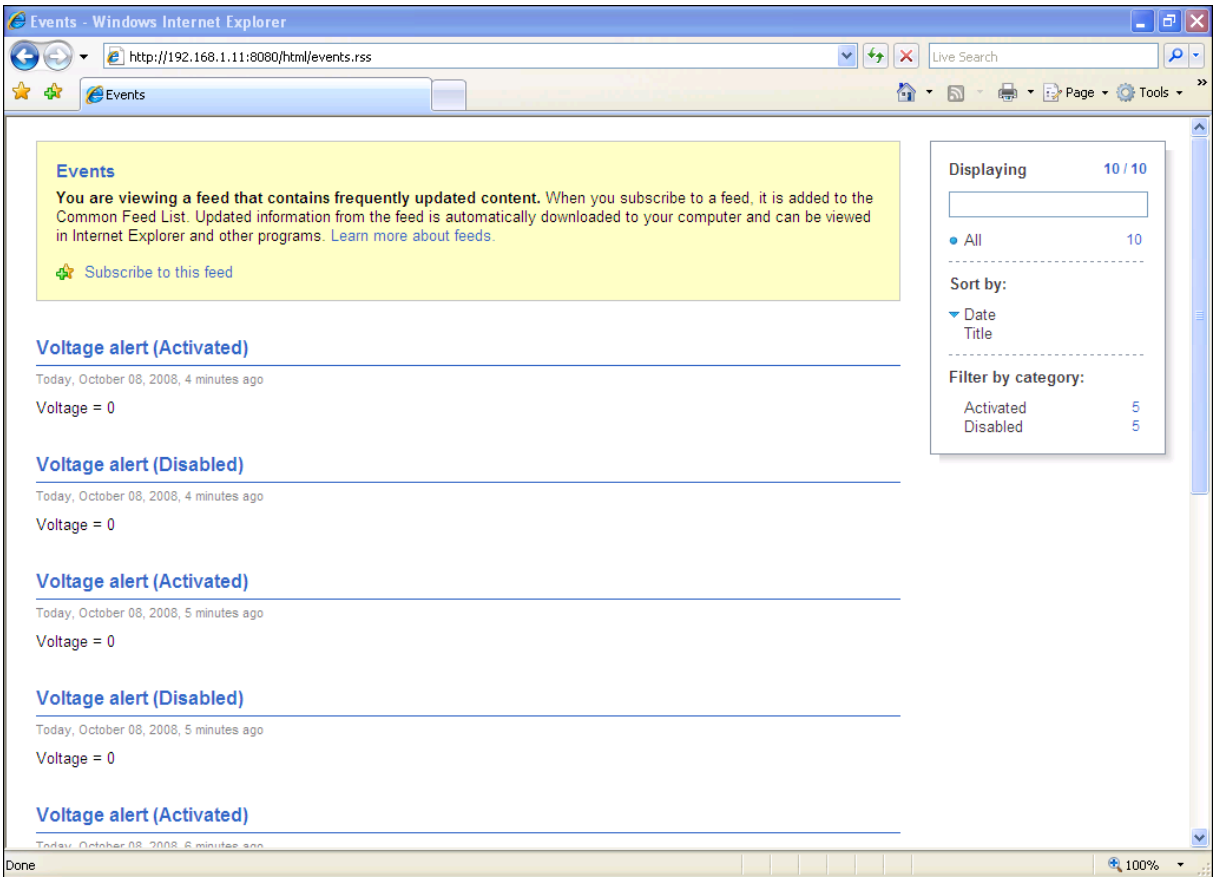


The engine can be configured as a RSS content producer so that we can generate news related to the events which can be consulted by any RSS news reader (available free for almost any platform and environment).To do so activate the corresponding box in the '*Configuration of the RSS feed*' window and configure the two required fields. In the '*URL server*' field the address to which the HTML server is configured is added and in the '*Number of news feeds*' we add the maximum number of news stories we want to publish (stories are published in a circle, so that when the maximum number of stories are published the oldest are removed to continue publishing new stories). Typically browsers detect that the server contains an RSS feed and allow access thereto (subscribe).



Message on Internet Explorer about the RSS FEED found

For example, the RSS newsreader provided by Internet Explorer would allow us to consult the news published by the engine, and is displayed as follows:


Events - Windows Internet Explorer
http://192.168.1.11:8080/html/events.rss
Live Search
Events
Page
Tools
Events
You are viewing a feed that contains frequently updated content. When you subscribe to a feed, it is added to the Common Feed List. Updated information from the feed is automatically downloaded to your computer and can be viewed in Internet Explorer and other programs. Learn more about feeds.
Subscribe to this feed
Displaying 10 / 10
All 10
Sort by:
Date
Title
Filter by category:
Activated 5
Disabled 5
Voltage alert (Activated)
Today, October 08, 2008, 4 minutes ago
Voltage = 0
Voltage alert (Disabled)
Today, October 08, 2008, 4 minutes ago
Voltage = 0
Voltage alert (Activated)
Today, October 08, 2008, 5 minutes ago
Voltage = 0
Voltage alert (Disabled)
Today, October 08, 2008, 5 minutes ago
Voltage = 0
Voltage alert (Activated)
Done
100%

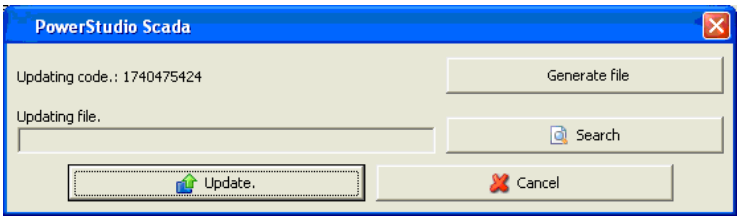
Displaying the RSS news released by the Engine/ Editor on Internet Explorer

Of course there are other RSS readers that display the news in different ways for almost any imaginable environment, including mobile devices, PDAs, etc. Observe what must be configured in each event in order to publish a RSS news item relating to it or not.

2.2.13.1 Updates

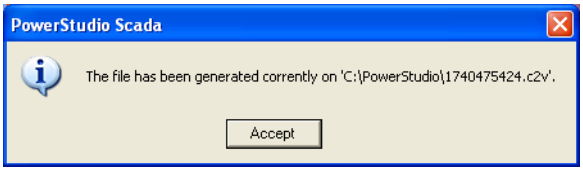
In cases where you have a version of the software and want to upgrade or expand this limitation, updates should be from the USB key.

Click on the '*Updates*' button in the '*Preferences*' dialogue and the following window will appear.



To update follow these steps

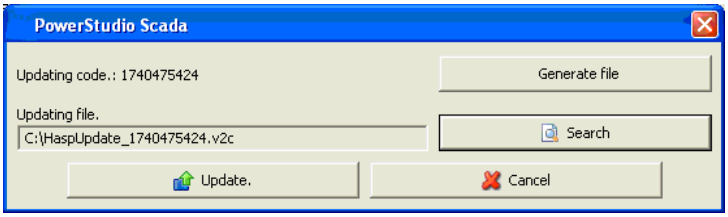
1. Click on the '*Generate file*' button. This button will generate a file with the information required to perform the update. Once the file has been generated the following message will appear:



   Reporting where the file with the c2v extension containing software information has been generated.

2. Send the file produced in the previous step to its usual distributor, so you can create the updated file. You should wait for your distributor to send you the updated file, with the v2c extension, to continue.

3. Once your distributor has sent the updated file, click on the '*Search*' button to select the file.



   In this case the file is 'HaspUpdate_89553109.v2c', which can be found in the root directory on your hard drive.

4. Click on the '*Update*' button and wait until the end of the update.

Whenever necessary an update should be made carrying out the steps described previously.
The file sent by your distributor, with the extension v2c will only serve for one update and may be deleted afterwards.
It is only possible to update USB keys. It is not possible to update parallel keys.
The USB key update must be done with Administrator rights.

2.2.13.2 User authentication

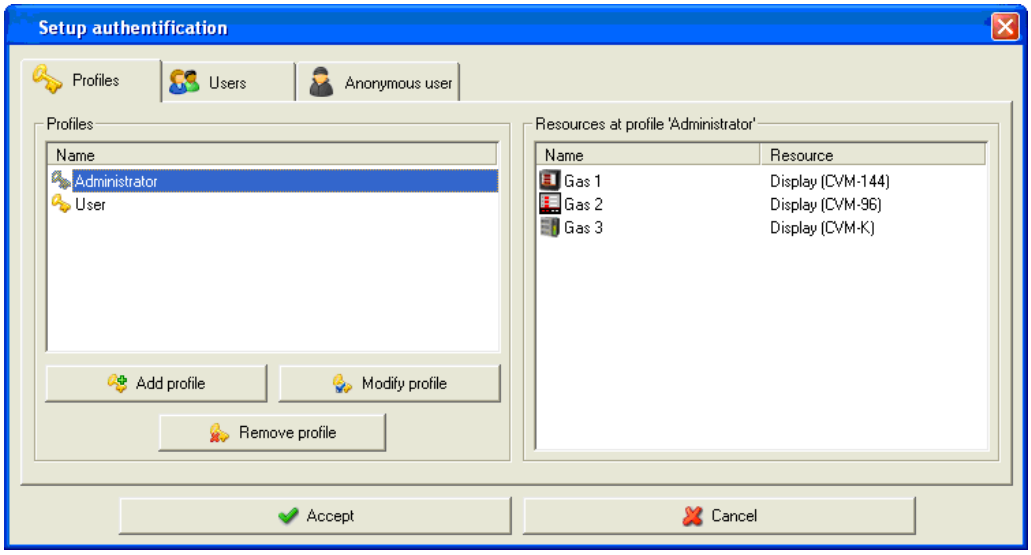
This section explains how remote user access to the application resources is configured.

A series of profiles are defined. These profiles contain the resources that can be accessed; a resource can be assigned to more than one profile.

Similarly, users are defined as those who are authorized to access the application resources. Each user will have a name and a password to enable identification by the application and avoid non-authorized user access. Each authorized user will be assigned one or more profiles, allowing access to all the resources contained in profiles. A profile can be assigned to more than one different user.

Finally, access by an anonymous user may be enabled. This anonymous user will not have a name or a password, allowing access to any remote user without the need for identification. Similarly, one or more profiles will be assigned to the rest of the users, allowing access to the different resources of the application.

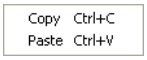
2.2.13.2.1 Profiles



Use this dialogue box to define profiles used for remote access to application resources.

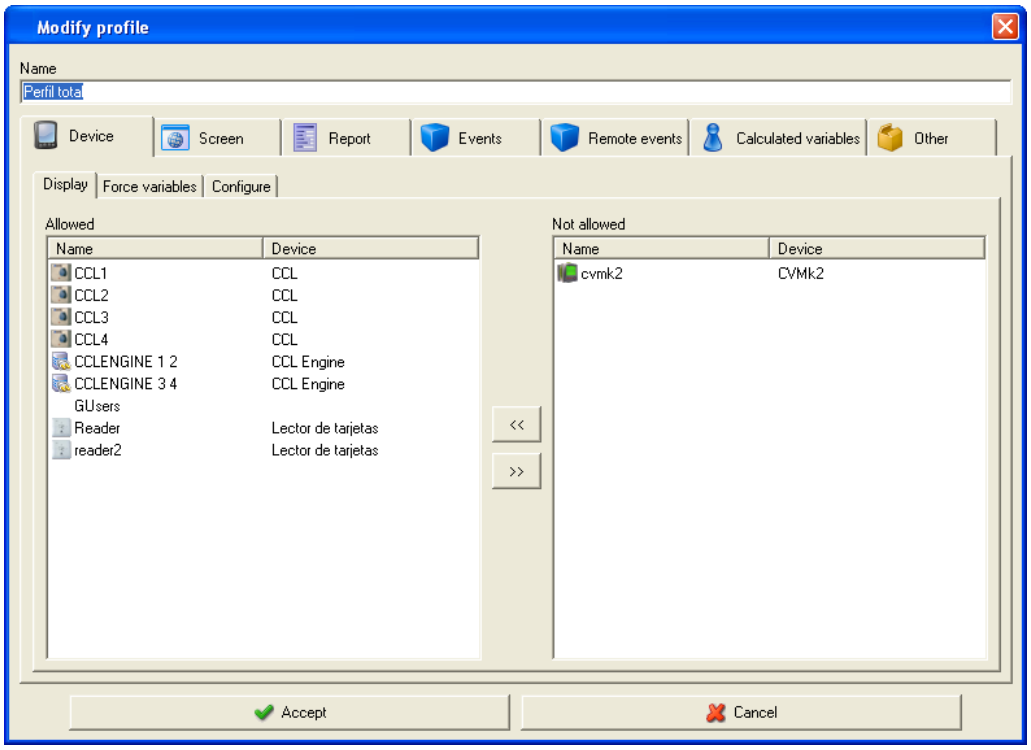
The list to the left of the dialogue contains the profiles, while the right-hand list shows the resources permitted to the selected profile.

Right click on the list of profiles to display the context menu,



to enable styles to be copied and pasted. Some options from the context menu may not appear; copy will only appear if there is a profile selected on the list, and the paste option only if styles have been previously copied onto the clipboard. If no profile is selected and there are no styles on the clipboard when the right button is pushed, the context menu will not appear.

Clicking on '*Add profile*' or '*Modify profile*' will bring up the following dialogue box:



In this dialogue box the name and resources of the profile may be added or modified depending on the button chosen. This name is used to identify the profile must be unique; two profiles with identical names are not permitted.

The list situated to the left of the dialogue box shows the resources added to the profile that can be used by the users who have that profile assigned, while the left-hand list shows the resources that the profile user does not have access to.

To add resources to the profile, "*Not Permitted*" should be selected from the resource list and passed onto the "*Permitted*" resource list using the << button. To delete resources from the profile do the opposite, select "*Permitted*" from the list and click the >> button to pass over to the "*Not Permitted*" list.

The resources that can be added to a profile are:

- ***Devices:*** Devices configured on the software.
  - ***View:*** Allows the chosen devices to be viewed.
  - ***Force variables:*** This allows device variables values to be forced. Only devices where it is possible to force one or more variable can be shown, for example digital outputs.
  - ***Configure*** Allows certain device parameters to be configured. Only devices where parameter configuration is possible will be displayed.
- ***Screens:*** Will show the various SCADA screens available to configure the application. See section 2.2.9 Screens.
  - ***View:*** Enables the chosen screen to be viewed.
  - ***Force variables:*** Permits variables to be forced using the "*force variable*" controls on the SCADA screens.
- ***Reports:*** Shows the defined reports. See section 2.2.8.

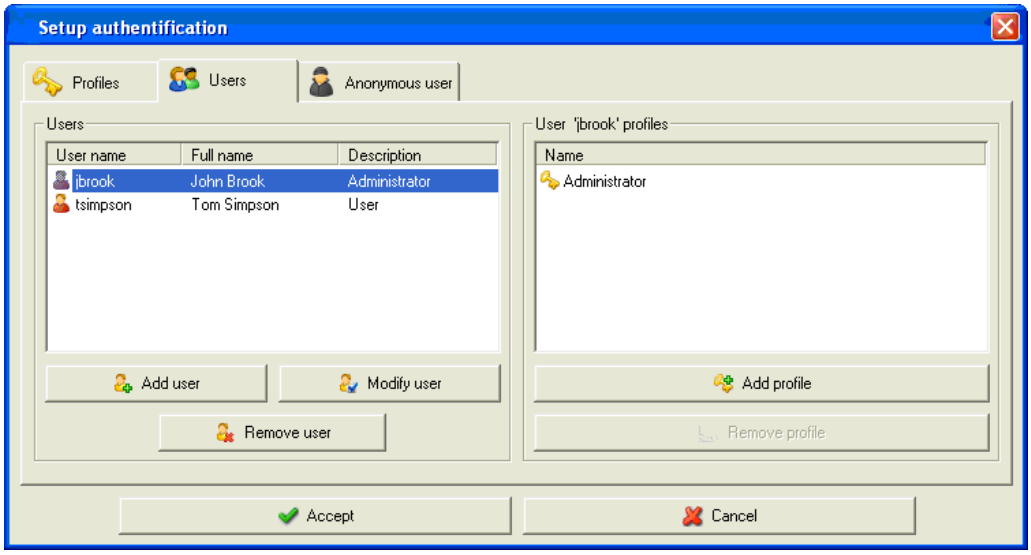
- ***Events:*** Will display the various events resources (see section 2.2.12 Events) that can be added to a profile:
  - *Run event actions in client application*. Will enable programmed actions to be carried out on the client application when enabled, acknowledged, disabled or while events are being produced.
  - *Acknowledge reported events*. Allows a reported event to be acknowledged.
  - *Active events display*. Enables or disable active events display.
  - *Reported events display*. Enables or disables display of reported events.
  - *Display events variables:* Allows graphs and tables of the variables generated by events to be displayed (see section 9.4 Event Variables)
  - *Display event browser*. Displays the list of events stored on file, whether reported or not.

- ***Remote events:*** Displays the different event resources from remote engines to which the engine application may be connected (See section 2.2.12 Events). These events may be added to a profile:
  - *Display active events.* Enables or disables active events display.
  - *Display reported events.* Enables or disables display of reported events.
  - *Acknowledge reported events.* Allows a reported event to be acknowledged.

- ***Calculated Variables*** Allows graphs and tables of calculated variables configured on the software to be displayed (see section 2.2.5 Calculated variables)
  - *View:* Allows the calculated variables to be displayed or not displayed.
  - *Force variables:* Allows the value of the variables to be forced or not forced.

- ***Others*** Displays the system events table.

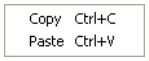
2.2.13.2.2 Users



Use this dialogue box to define the users who will have access to application resources.

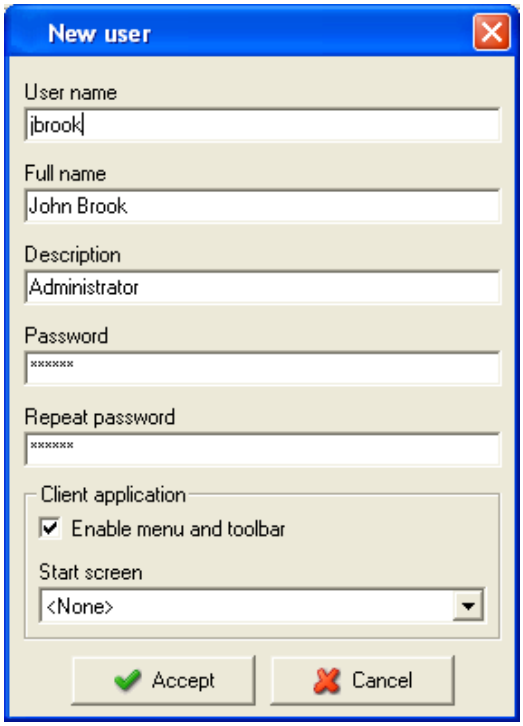
The list to the left of the dialogue contains the profiles, while the right-hand list shows the resources permitted to the selected profile.

Right click the user list and following contextual message will appear:



Allowing users to be copied or pasted. Some of the options from the context menu may not appear. Copy will only appear if there is a style selected, and the paste option only if the styles have been copied onto the clipboard. If no user is selected and there are no users on the clipboard when the right mouse button is clicked the context menu will not appear.

To add or modify a user, click on the button corresponding to '*Add user*' or '*Modify user*'.

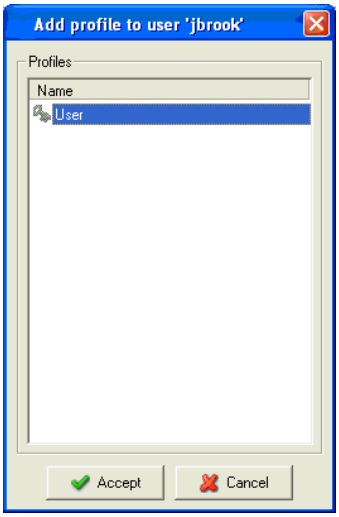


Where:

- **User name:** Will be an alphanumeric field which uniquely identifies the user. This field will be used to identify the user when necessary.
- **Full name:** Corresponds to the user's Full name.
- **Description:** Field which permits a brief description of the user to be entered.
- **Password:** Password which serves to avoid unauthorized users accessing the application resources.
- **Confirm password:** Field which serves to validate the password entered in the previous field. The values entered in the 'Password' and 'Confirm Password' must be the same in order to consider the password valid.
- **Enable menu and toolbar:** Enables the menu and the application toolbar for the user.
- **Start screen:** Allows the start screen viewed by the user from the client to be configured.

To delete one or more users, select those users we wish to delete from the user list and click "*Delete User*" button.

Click on the "*Add Profiles*" button and new profiles can be assigned to the user selected from the user list.

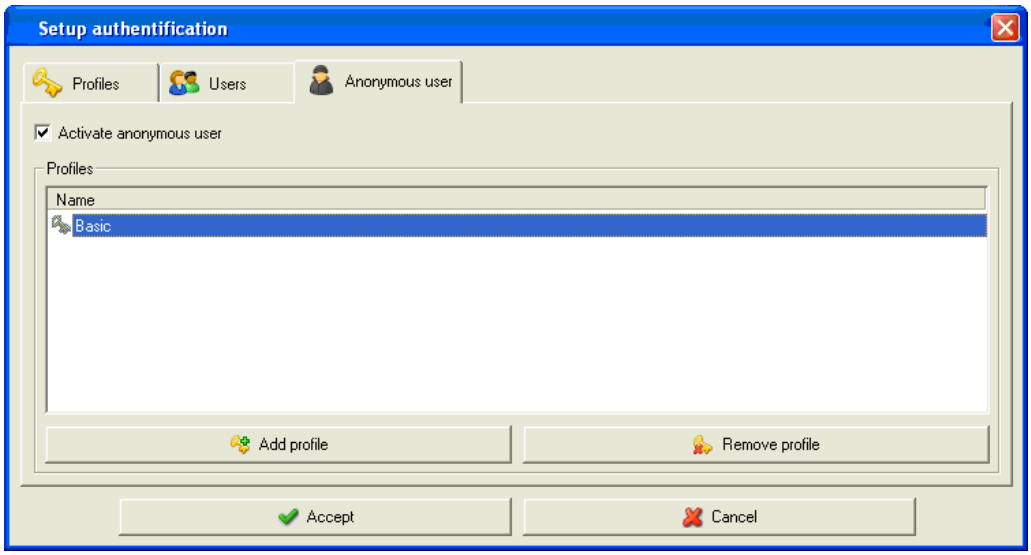


The dialogue will only show those profiles which have not been previously assigned to the user. In this case for the user "*jburgos*" only the "Supervisor" profile will be shown as it is the only one which has not been assigned to the user. On choosing "*Accept*" the profiles selected from the list will be assigned to the user.

To delete a user profile, select the desired user profiles and click "*Delete profiles*" button. Bear in mind that these profiles are only deleted from the user profile list and in no case are they deleted from the application.

2.2.13.2.3 Anonymous User

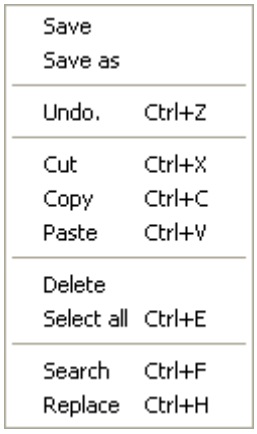
There is a special type of user that from now on will be known as anonymous user. The main difference between this type of user and the other users is that they do not have a name or a password. The anonymous user can access the application resource to which they have access without having to enter a name and a password. To avoid unauthorized access, this user can be disabled to have greater control over those who can access the resources and those who cannot.



Enabling or disabling the "*Activate anonymous user*" option will activate or not the option to permit the anonymous user by way of the Java Client.

2.2.13.2.2 UsersThe list will show the profiles assigned to the anonymous user, with the "*Add profile*" and "*Delete profile*" buttons working the same as those of any other user (see section 2.2.12.2.2 Users)

2.3 Edit Menu[1]



The options from this menu are only enabled when editing SCADA screens or reports.

2.3.1 Save

This option is used to save any change made to a SCADA screen or report.

This option will only be enabled if a change has been made to a SCADA screen or report.

2.3.2 Save as

This option allows changes made to a SCADA screen or report to be saved with another name.

This option will only be enabled if a change has been made to a SCADA screen or report.

2.3.3 Undo

This option is used to undo any change made to a SCADA screen or report.

This option will only be enabled if a change has been made to a SCADA screen or report.

2.3.4 Cut

Use this option to copy selected controls to the clipboard and delete them from the editor.

This option is only enabled if there is at least one control selected on the editor.

2.3.5 Copy

Using this option the controls selected are copied onto the clipboard. Unlike the "*Cut*" option the controls are not deleted from the editor.

This option is only enabled if there is at least one control selected on the editor.

2.3.6 Paste

Using this option the controls previously copied from the clipboard can be pasted onto the clipboard.

This option is only enabled if the clipboard contains valid controls for PowerStudio.

[1] Only in SCADA and Deluxe versions

2.3.7 Delete

Use this option to delete the selected controls.

This option is only enabled if there is at least one control selected on the editor.

2.3.8 Select All

Using this option all the SCADA control screens or a report can be selected.

2.3.9 Find

This option is used to find any text in a SCADA screen or report.

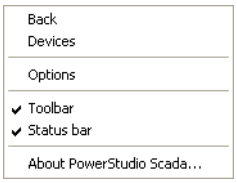
This option will only be enabled when editing a SCADA screen or report.

2.3.10 Replace

This option is used to replace any text in a SCADA screen or report.

This option will only be enabled when editing a SCADA screen or report.

2.4 See Menu

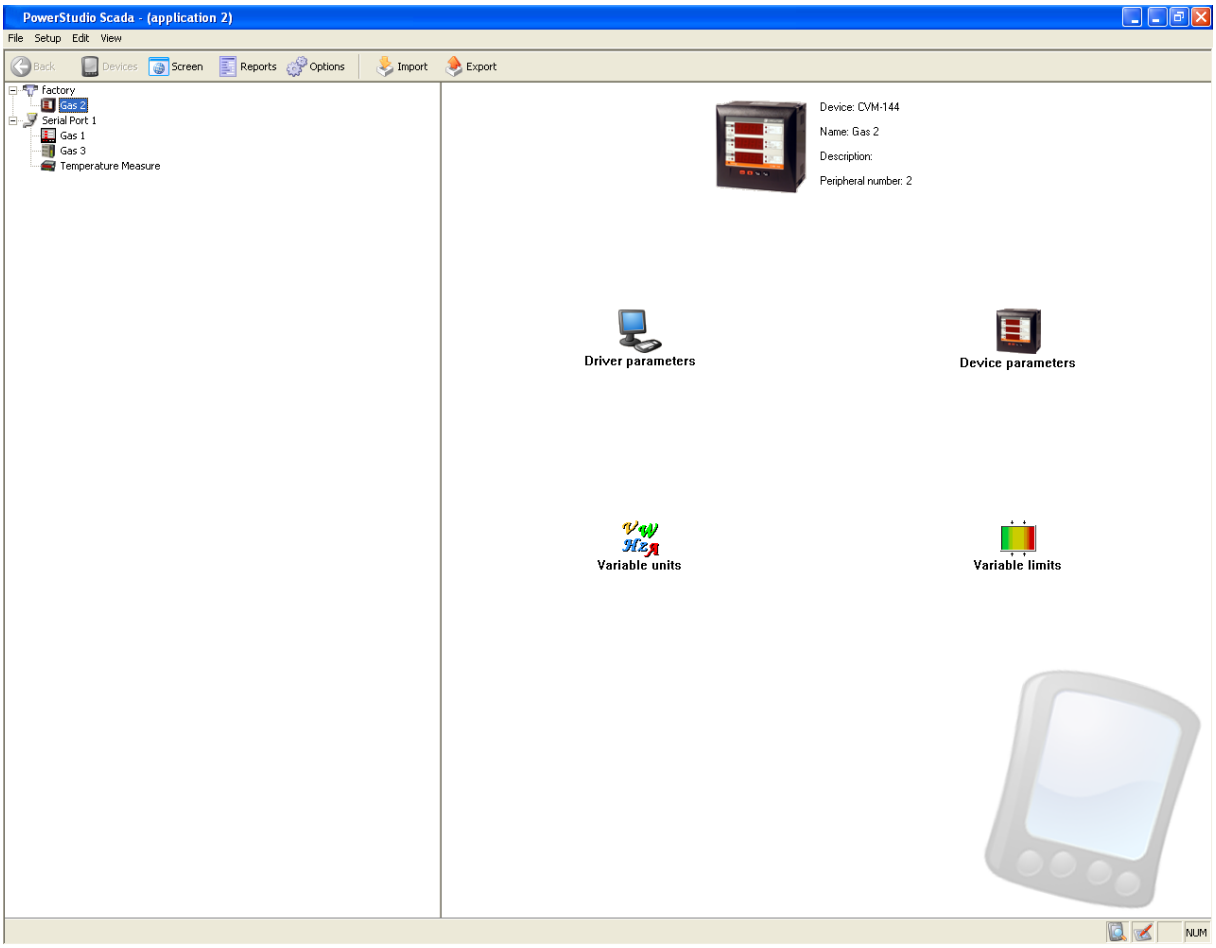


2.4.1 Back

This option displays the previous screen.

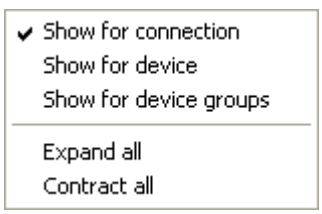
2.4.2 Devices

Clicking on the devices will open a screen similar to the following:



It is also possible to view this by clicking the "*Devices*" button on the toolbar.

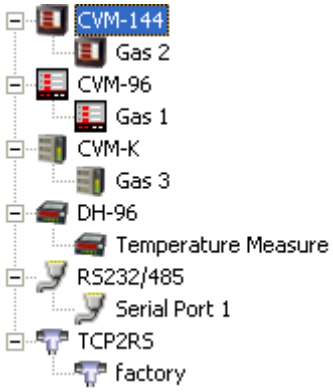
The tree on the left of the window shows the status of all configured devices. Right click the tree and the following context menu will appear:



The options are:

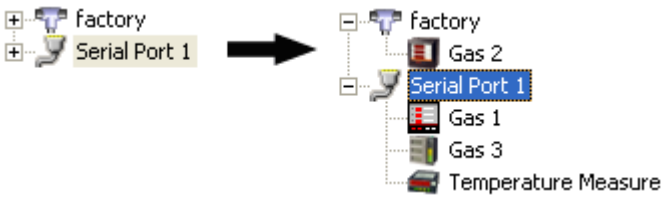
- **Display by Connection:** 2.2.1 DevicesThe devices are shown as they have been entered onto the device screen (see section 2.2.1 Devices), where the first and second-level devices are displayed.

- **Show by device:** The devices are classified according to their type.



- **Display by device groups:** The devices are displayed according to the organization set by the user.

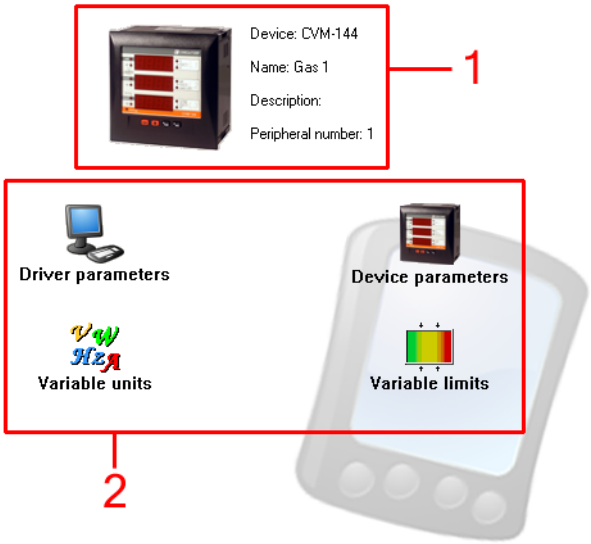
- **Expand all:** Click to expand the entire tree showing all the devices.



- **Contract all:** Clicking on this option will hide second-level devices.

From the device group view, right click to add, modify or remove new groups and devices. The context menu will change in the following manner:

The information found on the right side of the window:



Contains general information about the device selected on the tree (1) and device settings (2). These may be accessed by pressing the *'Options'* button on the toolbar.

2.4.3 Display options

Contains the parameters to modify the Java client display screens of the device values.

This menu option will depend on what is being shown on the screen, and will be explained in the corresponding sections, when the devices, tables and graphs are explained.

2.4.4 Toolbar

With this option the toolbar can be displayed or hidden.

This bar contains the main elements of the View menu.

- ***Back:*** See section 2.4.12.4.1
- ***Devices:*** See section 2.4.2
- ***Screen:*** See section 2.2.9
- ***Reports:*** See section 2.2.8
- ***Options:*** See section 2.4.3
- ***Import***: See section 2.1
- ***Export:*** See section 2.1

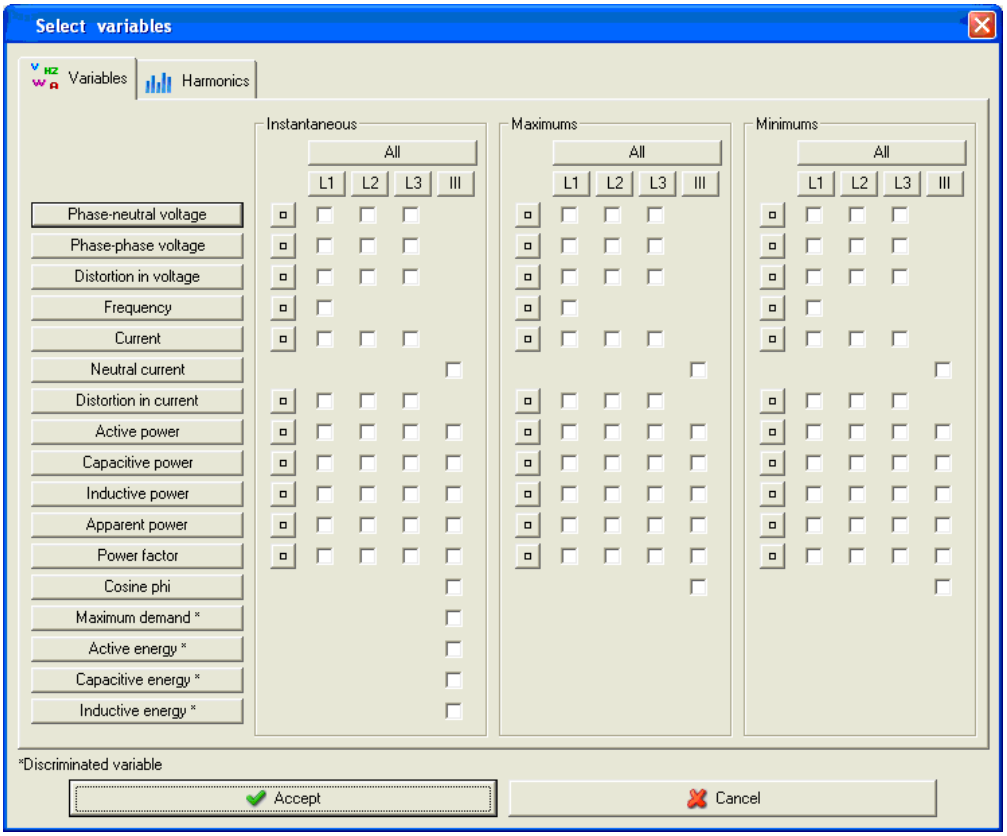
2.4.5 About

Shows information about the software.

3 Variable selection

When selection of one or more device variables is necessary, the variable selection dialogue. It is possible to select both analogue variables (voltage, current, power, etc...), as well digital variables on equipment which permits this.

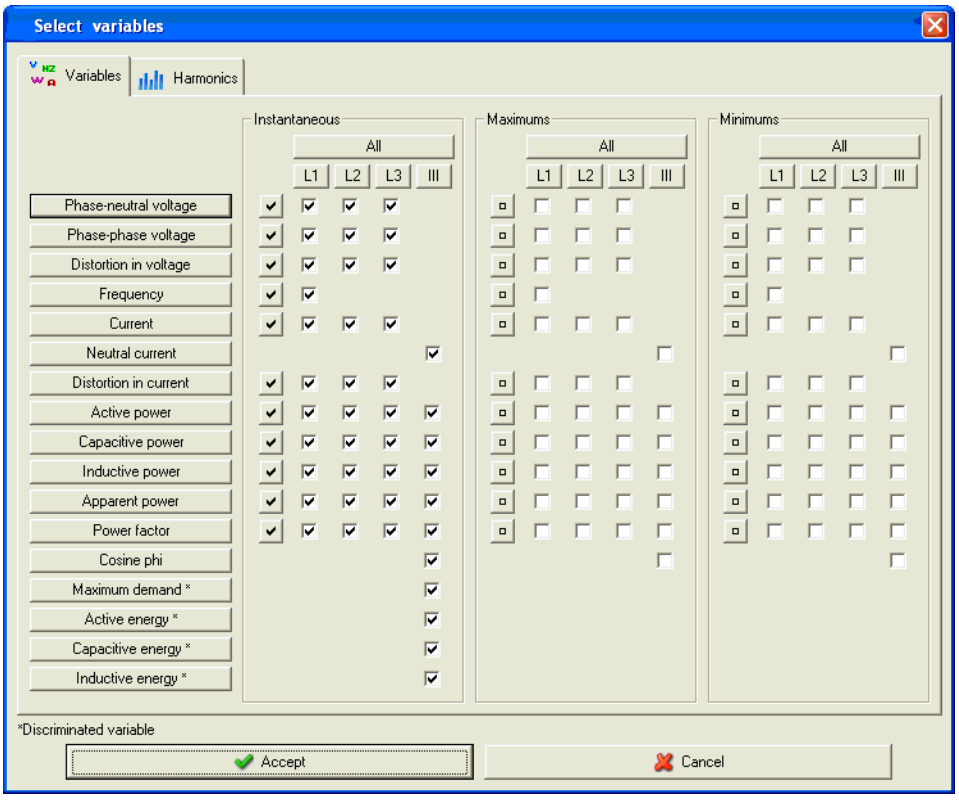
First the selection of analogue variables will be detailed. This dialogue will depend on the device connected, the explanation corresponding to CVM-96 can be used for this section.



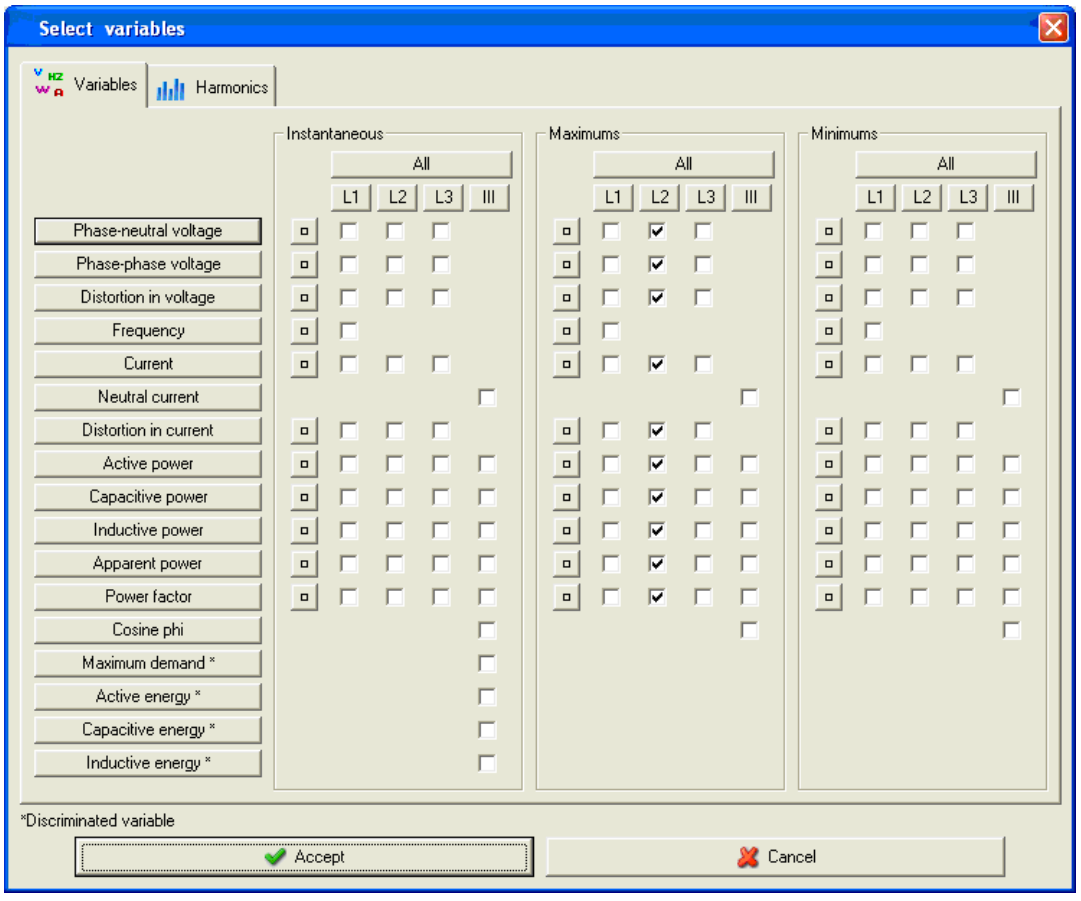
Where the desired variables may be checked. If any variable is already selected it will appear marked as ☑ and may not be unchecked.

If a filter has been selected, either by default or otherwise, the filter variables will appear marked on the button as Active energy * and an explanation will appear on the lower part of the screen *Discriminated variable

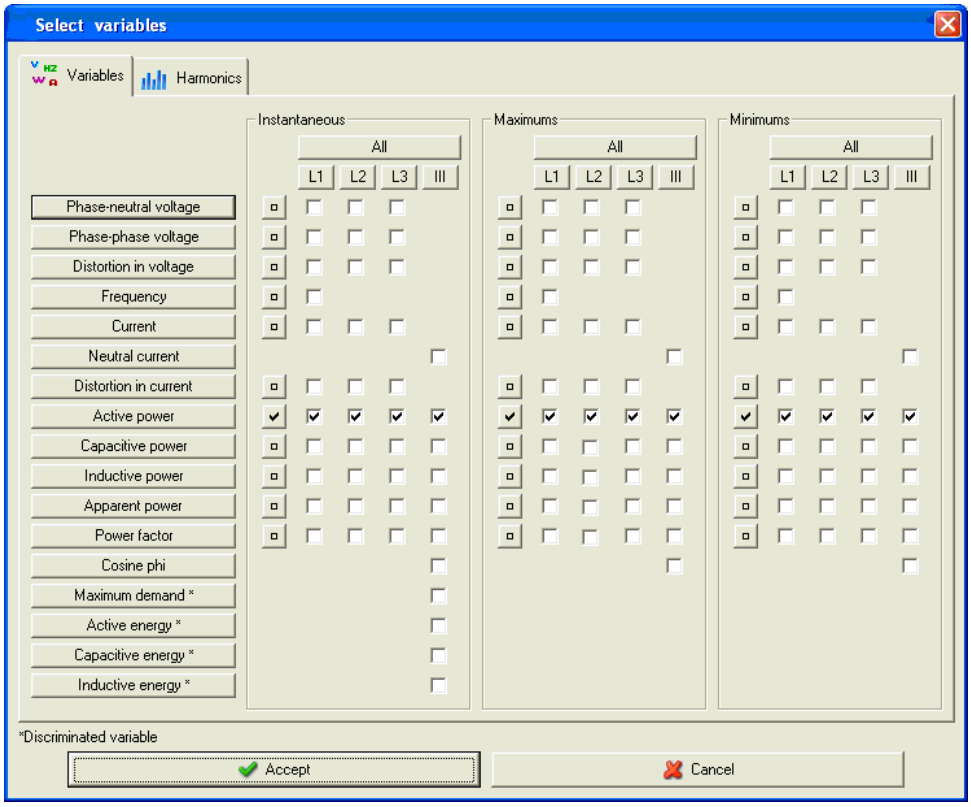
If the All button is clicked all the variables will be selected or deselected.



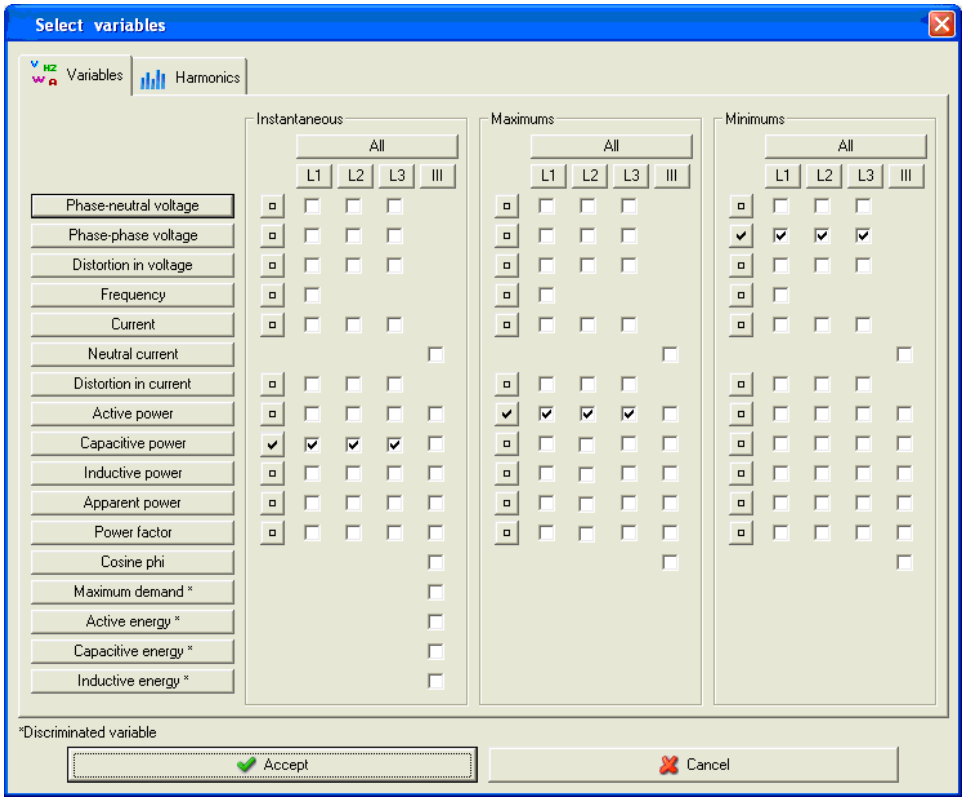
Clicking on one of the phase buttons L1 L2 L3 III will select or deselect only the variables for that phase.



Click on one of the variables, for example Active power and all boxes for this variable will be selected.



Finally, click on ▫ phases 1, 2 or 3, and instant, maximum or minimum, are selected according to the button pressed. If all three phases are selected the button switches to ☑ and when pressed the 3 phases are deselected.



4 Filters

PowerStudio provides a complete set of tools that allow the definition of energy filters as well as further analysis and study on the data collected by the devices in both a powerful and intuitive manner.

A filter study provides a consistent result in an energy consumption representation for each type of hour (counter) defined at any moment. This representation can be displayed either as a table or graph.

It is also possible to study this data displaying it at different time intervals or grouping it together in different periods. They may be displayed in annual intervals and grouped by months, in monthly intervals and grouped by days, etc.

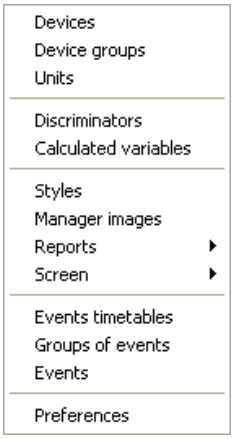
The filter studies consist basically of defining the filters (typically a calendar) and applying said filter to the data stored in a device. Therefore, a representation of the study realized can be obtained as the user desires (and visible both in graph and table format.)

The time bands defined in the filters are in the editor's local time.

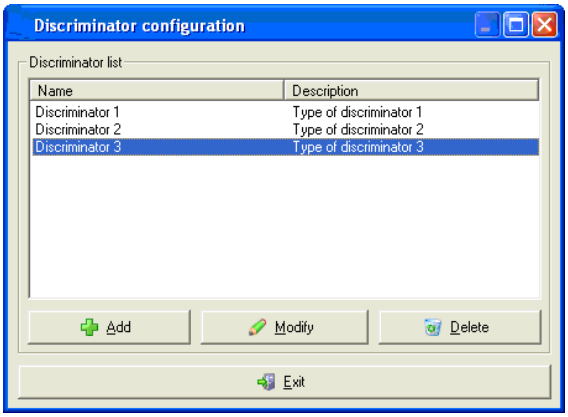
4.1 Filter configuration

The first stage is configuration of the filters we want to apply to the data for analysis. The user can add new filters and delete or modify existing filters.

To manage these actions the option "*Filters*" must be selected from the "*Set up*" menu.

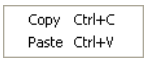


The following dialogue will appear:



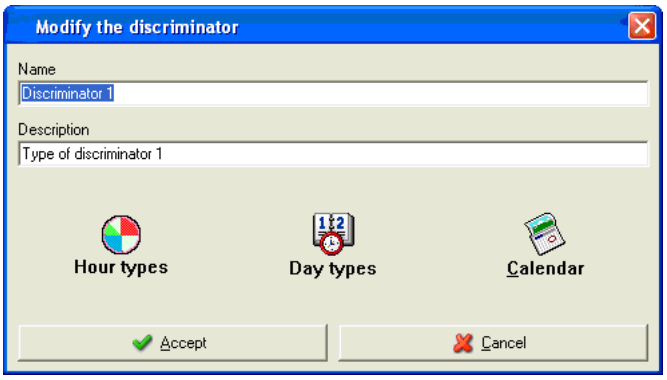
Here filters can be added, deleted or modified.

Right click the filter list and the following contextual message will appear.



enabling filters to be copied or pasted. Some of the options from the context menu may not appear. Copy will only appear if there is a style selected, and the paste option only if the styles have been copied onto the clipboard. If no filter is selected and there are no filters on the clipboard when the right button is clicked the context menu will not appear.

When "*Add*" or "*Modify*" from the "*Filter Configuration*" dialogue is clicked the following dialogue will appear:



Alphanumeric type data enabling unique identification of the filter.

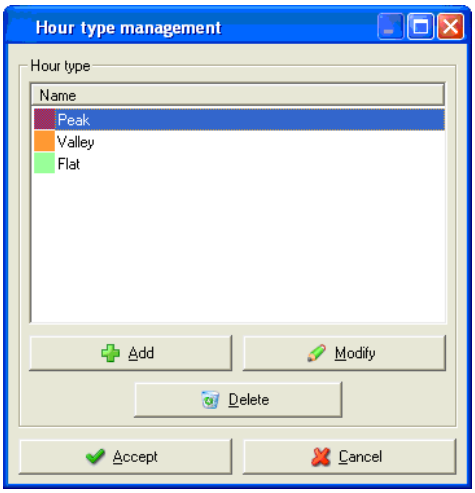
Alphanumeric type data enabling user to enter a brief description of the filter.

Configures the different types of hours defined in the filter.

Configures the different types of days defined in the filter.

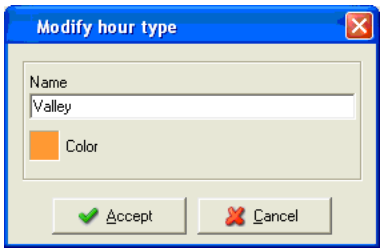
Configures the filter calendar.

4.1.1 Types of hours



Through this dialogue the different filter hour types may be added, deleted or modified. These types of hour are the basic elements of the definition of the filters. Here the registered consumption is distributed in accordance with the calendar (maximum energy and demand).

Typically the types of hours correspond to the various prices that can be applied to the energy consumed in accordance with the time zone or day). When adding or modifying the following dialogue will appear:

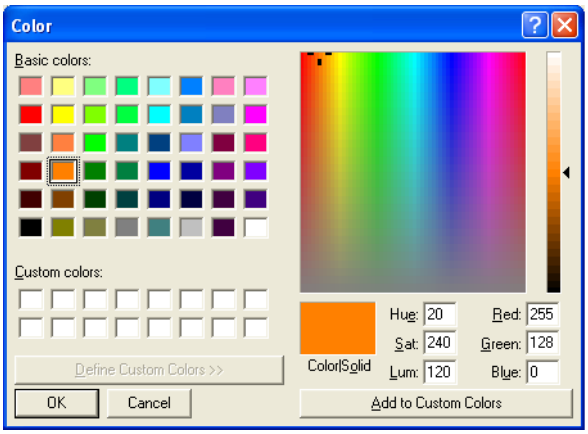


Where:

Alphanumeric type data for uniquely identifying the type of rate hour.

Color that visually identifies the type of hour within the filter and will be used for the graph which results from applying this filter to data stored by any device (all counters for the various maximum demand and energy variables).

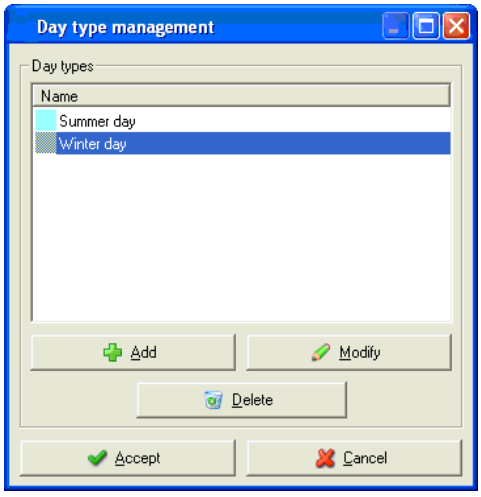
Left click on colored box 1, and the following dialogue appears, where the color for the type of day may be configured.



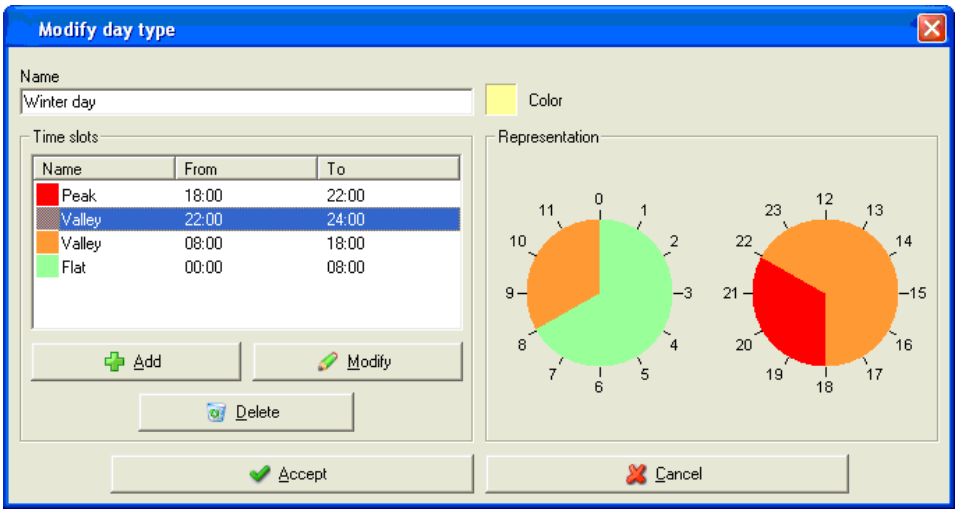
Clicking the "*Delete*" button, will delete all the selected hour types from the list.

Once defined they are distributed to each day defining the various day types that will make up our filter.

4.1.2 Day types



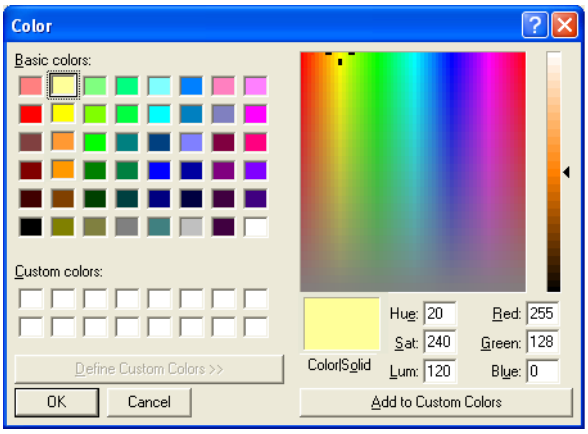
Use this dialogue to add, delete or modify the various day types. On adding or modifying the following dialogue will appear:

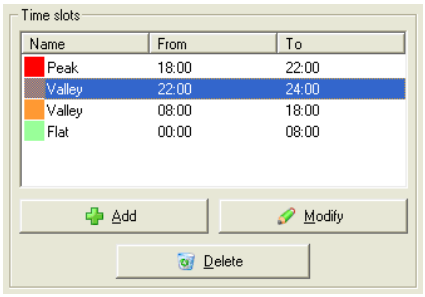


Defining a day type implies indicating the hour types into which it is divided (e.g. a Sunday could have all day defined as a type of reduced rate time and a weekday may be divided into two sections, i.e., day and night)

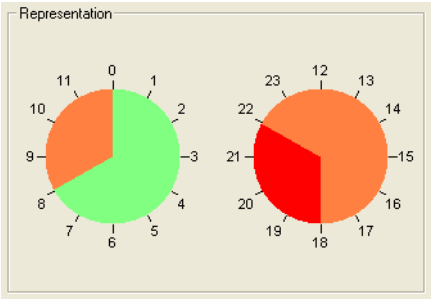
Alphanumeric type data which uniquely identifies the type of day within the filter.

Color that visually identifies the type of day within the rate. Left click on the colored box and the following dialogue appears, where the day type color may be configured.



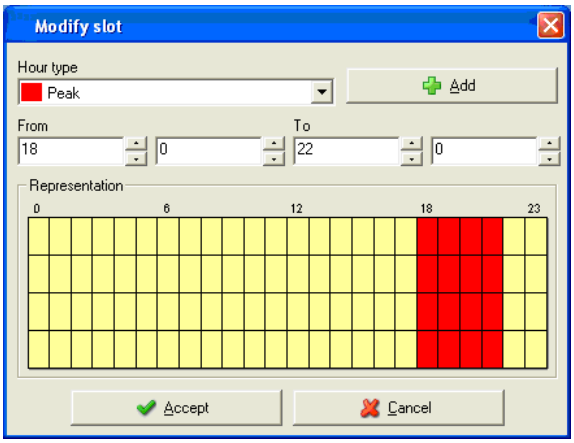


Time zones that day types configure. These zones should occupy the entire 24 hour period, but not overlap. In practice different sections within one day indicate that energy is billed differently in each one depending on the time of day in question.



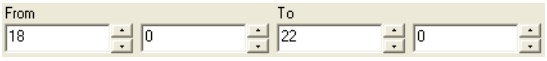
Graphs of time zones. This provides visual guidance how such a day is defined (enabling us to see at a glance, among other things, if any time zone throughout the day needs to be confirmed)

Adding or modifying a zone will bring up the following dialogue:

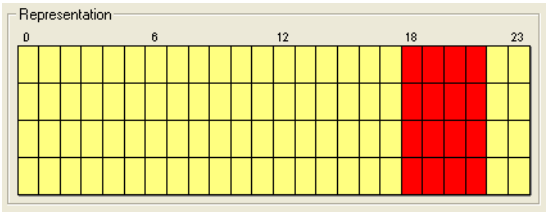


This corresponds to the hour type within the slot. 4.1.1 Types of hoursThe hour types will be those configured in section 5.1.1. Hour types

Use this button to add new hour types to the filter.



Numerical selection of a time zone.



Graph of the time zone. Each column represents one hour of the day, each row is a period of 15 minutes. For the slot selection proceed as follows:

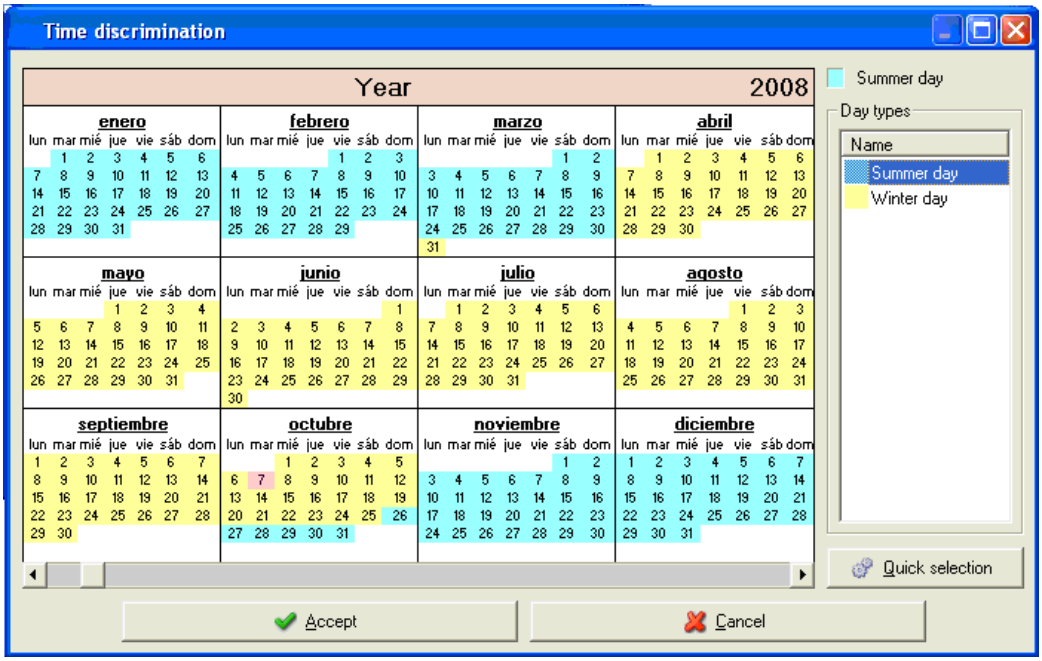
- Left click on the start of the time zone.
- Without releasing the button, drag it until the end of the time zone.
- Release the button and the time zone will have the color for the time of day

The zone can be defined manually in a numerical way but this is only useful if one wants to accurately define any slot precisely in minutes (for instance a zone from 10:10 to 15:40).

This dialogue only allows a continuous time zone to be defined.

4.1.3 Calendar

Once the day types making up the filter are defined they will be distributed in a complete calendar. To this end, the day types created beforehand in the filter process will be distributed on these calendars.



Day types may be assigned to the days of the year in course as well as to previous and forthcoming years. Day selection is done as follows:

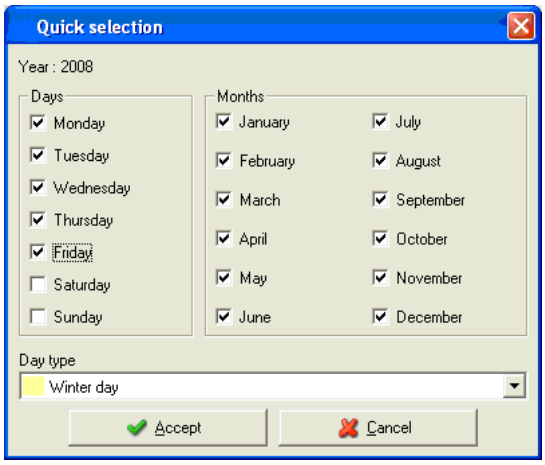
- Pressing on the desired day.
- Pressing on the day of the week selects all the days of the month for that day of the week.
- Pressing on the month name selects all the days of the month.
- Pressing on the year selects all the days of the year.
- Left click on a starting day and drag to select all the days that the cursor has passed through.
- Using the fast selection option.

Listing with the different day types configured under the rate.

Day type assigned to the calendar if selections are made. If no day type is selected

will appear, indicating that the days on the calendar will be selected rather than deleted.

with this option, selections will be made automatically. The following dialogue will appear.



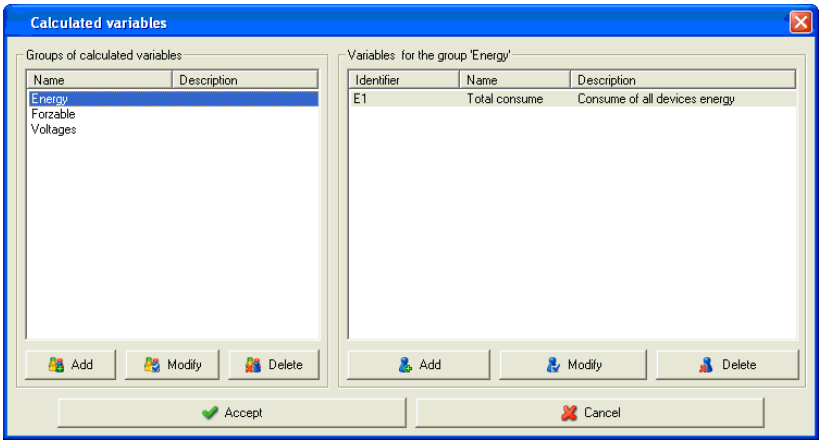
In this case every working day of 2005 will be checked with the "*Winter Day*" type.

Eliminate the selection by pressing on the day with the same selected day type.

5 Calculated variables

There are certain situations where it is necessary to obtain the results of an operation between the variables of the different devices, for example the sum of energies. PowerStudio has this type of feature available for the so-called calculated variables. The values of these variables will be the result of formulas comprising variable values from other devices or other calculated variables.

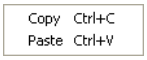
For a better organization, the calculated variables will be divided into groups of calculated variables.



Use this dialogue to define the groups and variables calculated to be used in the software.

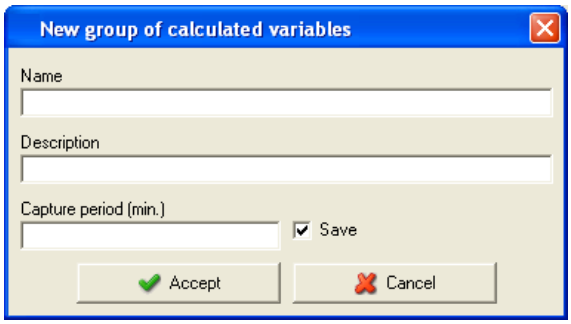
The list situated on the left contains the different groups of variables calculated, while the list on the right will show the variables calculated from the selected group.

Right click on the group list and the context appears.



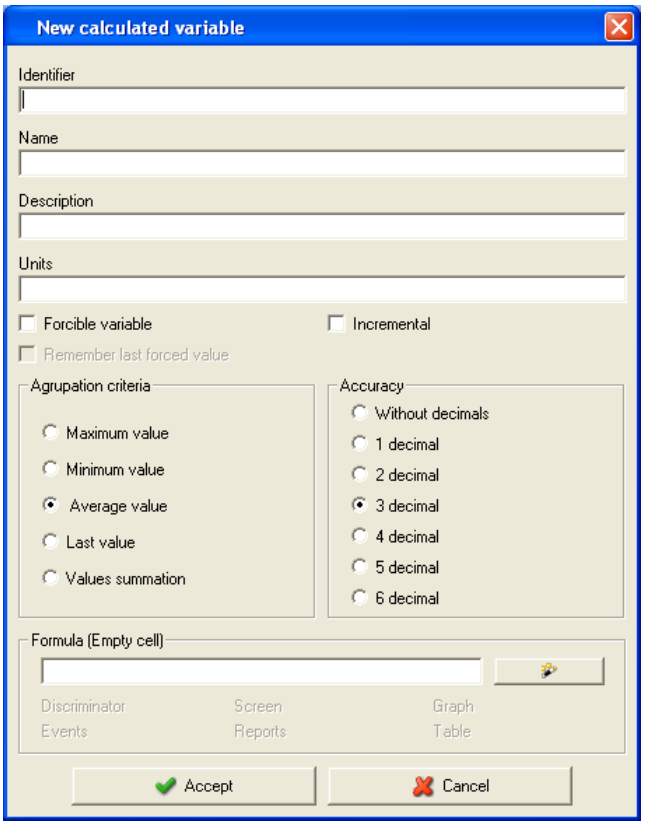
Allowing calculated groups of variables to be copied or pasted. Some of the options from the context menu may not appear. Copy will only appear if there is a style selected, and the paste option only if the styles have been copied onto the clipboard. If no group is selected and there are no groups on the clipboard when the right button is clicked the context menu will not appear.

When adding or modifying a group the following dialogue will appear:



Here the calculated variables group name and a brief description may be entered for better identification within the software.The calculated variables may also be saved along with the capture time in minutes.

When adding or changing a calculated variable this dialogue appears:



permitting configuration of the calculated variable.

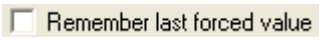
Allows each of the calculated variables to be used in expressions and conditions, see section 10.1 Expressions and conditions

Name of the calculated variable, used to better identify the variables.

Allows a text description of the calculated variable to be entered.

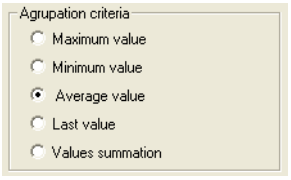
Text of the units in which the calculated variable value is expressed.

Here you may enable or disable the ability to change the value of the variable from the SCADA screen, or an event may be enabled ☑ or disabled ☐. Only variables that do not contain references to other variables, devices or calculations in the formula may be forced.



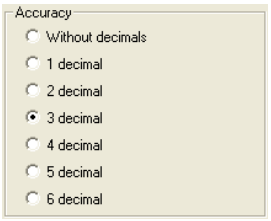
Allows for enabling ☑ or disabling ☐ the possibility of recalling the last forced value of the variable. This field is useful for rebooting the software using the last forced value.

Allows for enabling ☑ or disabling ☐ incremental calculation of the variable. This field is useful for viewing incremental, as opposed to absolute variable values.



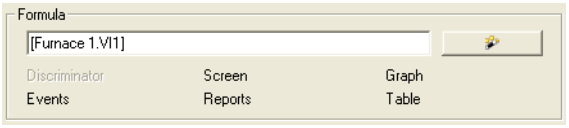
Enables the grouping criteria for virtual values in graphs, tables and reports to be selected. For example, if a value is given every 5 minutes (e.g. 10, 12 and 7), and the values are grouped every 15 minutes, i.e., all three values expressed at once, the value obtained will be:

- Maximum value: The maximum value of the 3 (12) will be shown.
- Minimum value: The minimum value of the 3 (7) will be shown.
- Average value: The average value of the 3 ((10 + 12 + 7) / 3 = 9.66) will be shown.
- Last value: The last value (7) will be displayed
- Sum of the values: The sum of the values will be shown (10 + 12 + 7 = 29).



This permits selection of the number of decimal places for the calculated variable.

Here the formula which will give the result of the virtual variable is shown. It can be entered manually or using the "*wizard*" (see 10.1.1 Expressions and Conditions Creation Wizard). Once entered the formula will be automatically analyzed and where it can be used will be shown. For example:



It can be used on SCADA screen and reports, to make graphs and tables with the values obtained, it can be used in the event conditions, but a filter cannot be applied.

The calculated variables are codified for their use in formulas and expressions like

R$CAL_group.variable

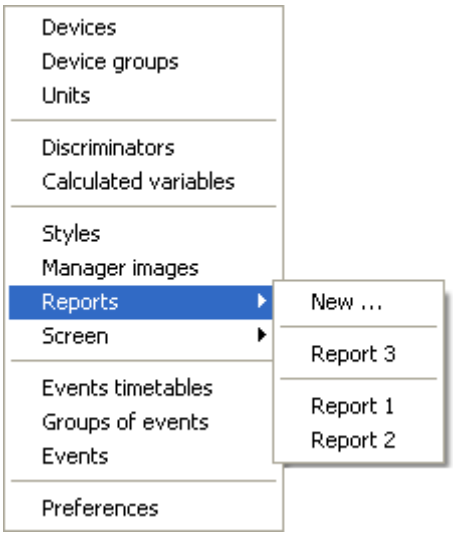
Using the prefix *R$CAL* tells the program that this is a calculated variable rather than a device *variable*, *group* is the name of the group to which the calculated *variable* belongs and finally, *variable* to the identifier entered in the field corresponding to the calculated variable.

6 Reports[2]

The "*Reports*" option from the '*set up* ' menu enables templates for reports to be designed.

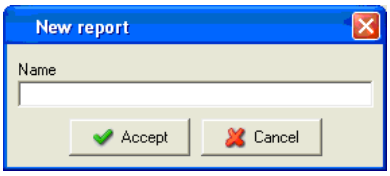
6.1 Add, modify and delete reports.

Click the "*Reports*" option from the '*Configure* ' menu to create, modify or delete reports. Several options will appear if reports have been previously created.



The '*New* ' option will appear and a new report may be created, followed by the name of the reports that have already been created (if any). Right click on any of the already existing reports to modify names and eliminate reports.

Selecting the '*New*' option brings up a window where the name of the new report to be created can be chosen.

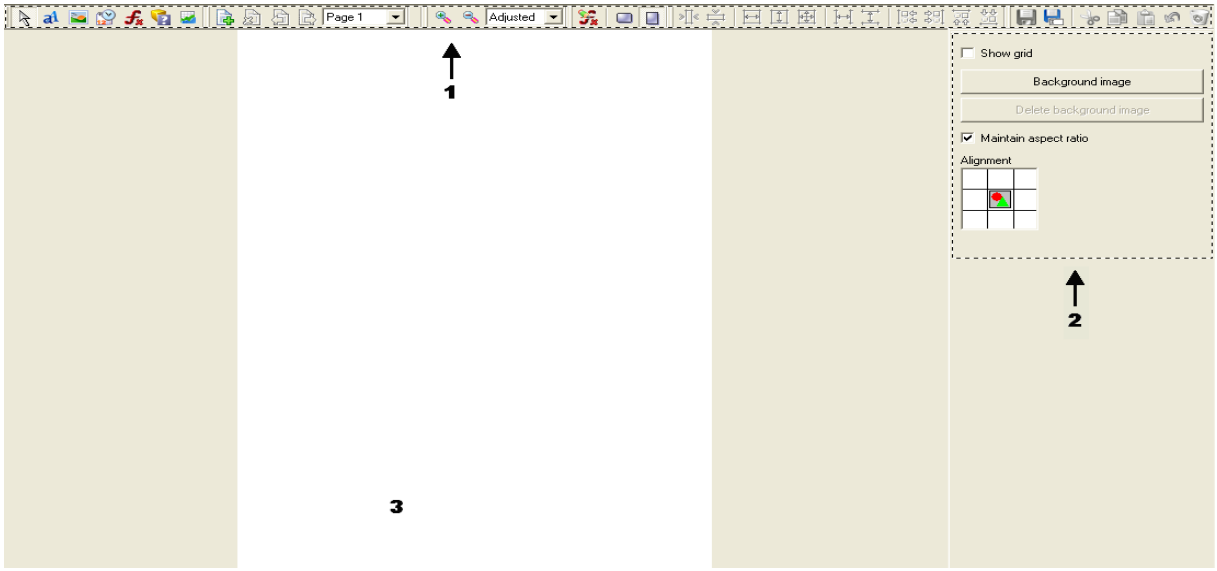


Selecting '*New*' or clicking an already existing report brings up a report design window.

[2] Only in SCADA and Deluxe versions

6.2 Report design window

The report design window looks like this:



The window is divided into three areas:

- Tools (1)
- Information panel (2)
- Report page (3)

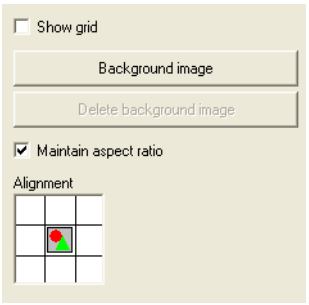
These tools allow the report design to be configured more easily.

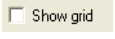
The information panel enables access to all the configuration options of a control, which is added to the report design and may be selected at that time.

The report sheet is the report design view.

Therefore, using the tools (1) controls can be inserted in the report sheet (3) whose properties can be configured in the information panel (2).

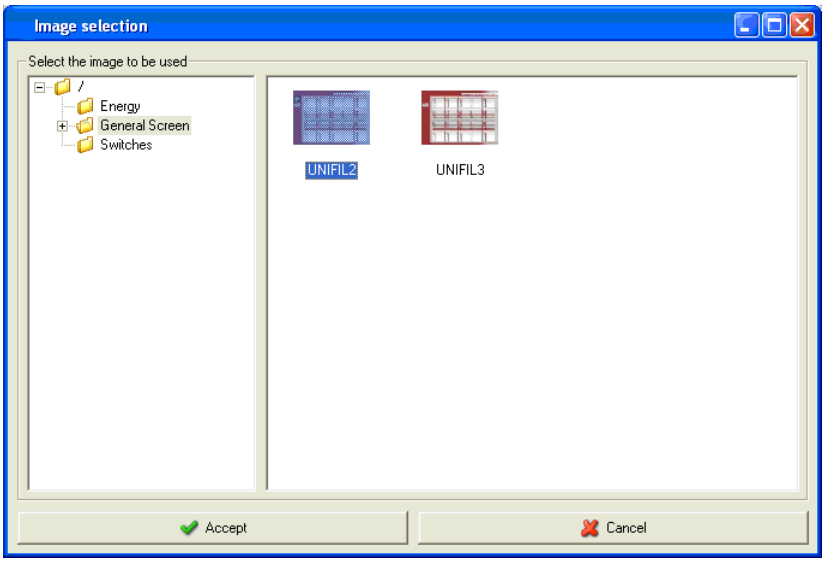
When a new report is being created, the configuration properties will appear by default in the information panel at the bottom of the report. These are the same properties that appear when no control selected.

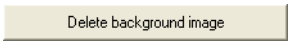




The '*Display grid*' option displays or hides the grid, which indicates the position of objects on the screen. If the grid is shown, the object will be automatically aligned to the grid.

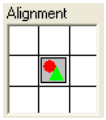
Select this option to add an image from the image manager (see section 2.2.7 Image manager) so that it can appear in the report background.



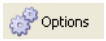


Click on this button to delete the present background image.

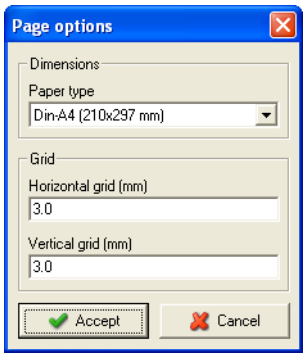
If enabled, this option will maintain the aspect ratio of the selected background image. If disabled, it will force the image to occupy the entire length and width of the report sheet, expanding or contracting it as required.



Enables the selected background image to be placed in any of the seven positions shown in the figure.

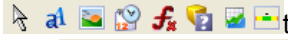
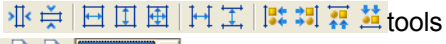
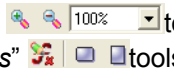


This button (situated in the upper toolbar) allows configuration of the grid characteristics as well as the size of the report page being detailed:



The size of the report page is selected from a list of standards for types of paper (DIN-A4, A3, A2, etc.) and the size of the grid will specify in millimetres, the distance between one point of the grid and another either horizontally or vertically.

In terms of tools, there are several grouped according to their use:

- "*Action*"  tools
- "*Positioning*"  tools
- "*Page*" tools
- "*Zoom*"  tools
- "*Various*" tools
- "Editing" tools

6.2.1 Action tools

6.2.1.1 Select controls

This tool allows the user to edit the properties of one or more controls that have been placed on the report page or to apply any other tool. Left click the control to select it. To select more than one control hold down the left mouse button and draw a selection box covering the desired controls. The controls outside of the selection box remain unchecked or cease to be selected if previously checked.

The behaviour of this tool can be changed by holding down the "*Control*" key or the "*Shift*" key. Select the desired *Control*s while holding down the "*Control*" key and the current selection is reversed, i.e. unselected *Control*s are selected and all selected controls are deselected. Holding down the "*Shift*" key will add controls that have not been selected to those which already have been.

6.2.1.2 Text control

This tool will allow fixed text strings to be included in the report. Select this tool and draw a selection box on the report by keeping the left mouse button pressed. The properties than can be configured from this control are:

Choice of a previously created text style or creation of a new personalized one.

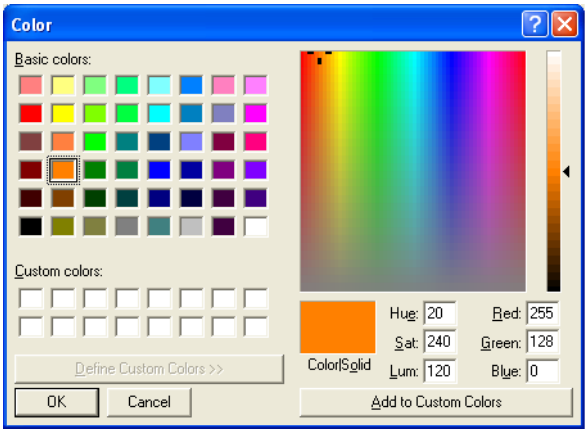
The style will apply to the font type used for the text.

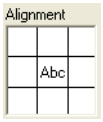
Depending on the font selected, bold and / or italics may be chosen.

Corresponds to the size of the font. The size may be between 1 and 90. The size can either be entered manually or selected from the dropdown menu showing the options available.

Corresponds to the text orientation. The orientation (expressed in degrees) may be between 0 and 350. The size can either be entered manually or selected from the dropdown menu showing the options available.

Clicking on this allows the text color to be selected.





This allows positioning of the text within the rectangle defined in the report sheet.

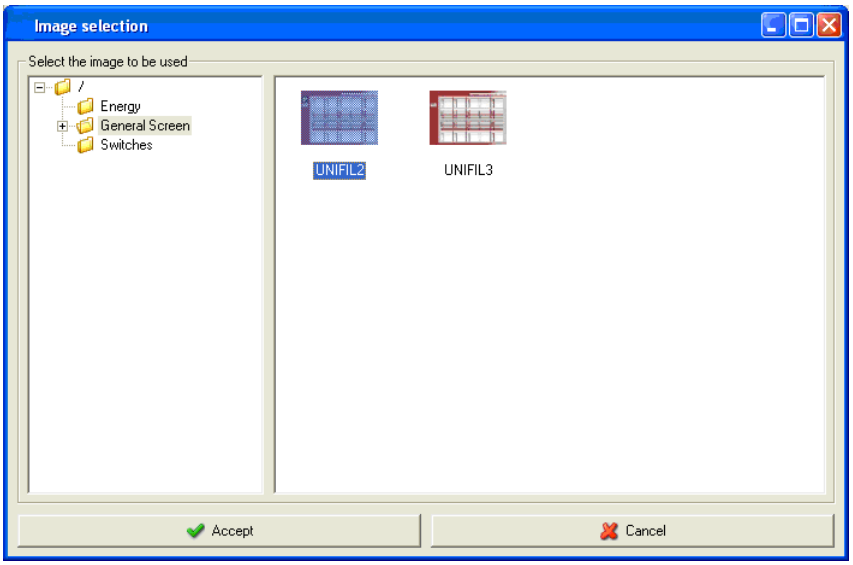
The text to be displayed is written here.

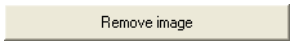
- Use this button to add the personalized configuration created for the active text control as a style for use with other controls.

6.2.1.3 Image control

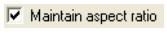
Use this tool to insert still pictures into the report. Select this tool and draw a selection box on the report by keeping the left mouse button pressed. The properties than can be configured from this control are:

Use this option to select an image from the image manager, see section 2.2.7 Image manager, to select an image to assign to the control shown in the report.

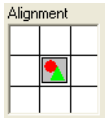




Click on this button to delete the present background image.



If enabled, this option will maintain the aspect ratio of the selected background image. If disabled, it will force the image to occupy the entire length and width of the rectangle defined in the report, expanding or contracting its measurements as required.



This will help decide on which side of the rectangle defined on the report sheet the image will be placed.

6.2.1.4 Date Control

This tool allows a date to be entered in the report (current or not). Select this tool and draw a selection box on the report by keeping the left mouse button pressed. The properties than can be configured from this control are:

This option enables the type of date shown on the report to be chosen. The following choices are available:

- *Any date:* Any date defined by the user.
- *Present date:* The date at the moment the report is made.
- *Start date:* The start date of the information used in the report.
- *End date:* The end date of the information used in the report.

The previously created text style may be selected or a new personalized one created for the date.

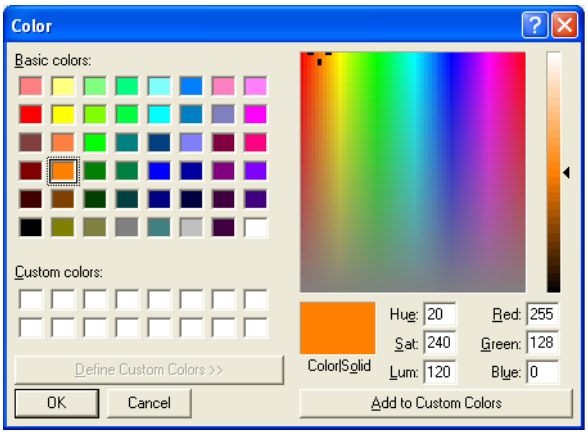
This corresponds to the type of font used for the date text.

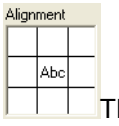
Depending on the font selected, bold and / or italics may be chosen.

Corresponds to the size of the date text font. The size may be between 1 and 90. The size can either be entered manually or selected from the dropdown menu showing the options available.

Corresponds to the orientation of date text. The orientation (expressed in degrees) may be between 0 and 350. The size can either be entered manually or selected from the dropdown menu showing the options available.

Click the button to select the date text color.





This will allow us to decide on which part of the rectangle defined in the report sheet the date text will be placed.

Here the date format may be established. Several are pre-defined and can be manually entered from the keyboard. The different models defined are:

- y → year. If the number of letters is 3 or more the full year is represented (2006) and if not the abbreviated value (06).
- M → Month of the year. If the number of letters is 3 or more it will be interpreted as the name of the month, if not the number of the month.

- d → Day of the month. The number of letters will be the minimum number of digits with which the value can be represented.
- E → Day of the week. If the number of letters is 4 or more the full name of the day of the week is displayed. If the value is less the abbreviation of the name is displayed.
- H → Time of day from 0 to 23. The number of letters will be the minimum number of digits with which the value can be represented.
- m → minutes. The number of letters will be the minimum number of digits with which the value can be represented.
- s → seconds. The number of letters will be the minimum number of digits with which the value can be represented.
- ‘ → Text may be added to any part of the model using quotation marks. The single quotation marks are only needed if some of the characters used in the models are desired.

This option will only appear in the case of having selected ‘*Any date*’. Wherein a specific date can be chosen to show in the report.

- Use this button to add the personalized configuration created for the active text control as a style for use with other controls.

6.2.1.5 Formula control

This tool will permit a formula to be included in the report (the final result will be seen in the report). Select this tool and draw a selection box on the report by keeping the left mouse button pressed. The properties than can be configured from this control are:

The previously created text style may be selected or a new personalized one created for the date.

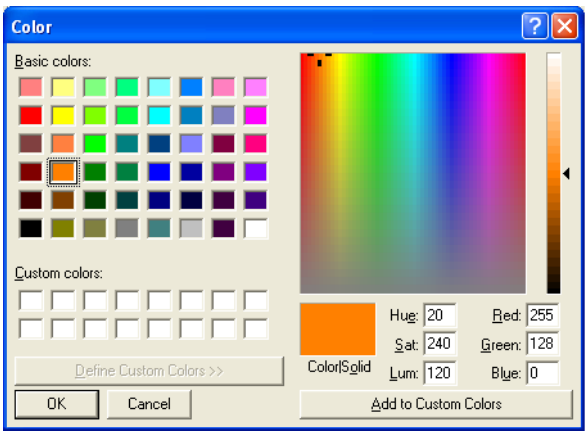
This corresponds to the type of font used for the formula text.

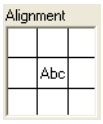
Depending on the font selected, bold and / or italics may be chosen.

Corresponds to the size of the formula text font. The size may be between 1 and 90. The size can either be entered manually or selected from the dropdown menu showing the options available.

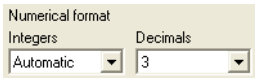
Corresponds to the orientation of text formula. The orientation (expressed in degrees) may be between 0 and 350. The size can either be entered manually or selected from the dropdown menu showing the options available.

Click the button to select the formula text color.



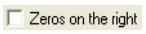


This will permit us to decide on which part of the rectangle defined in the report sheet the text formula will be situated.



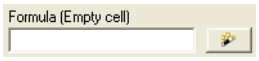
Using these selectors the number of whole and decimal numbers shown by the result value of the formula calculation can be specified.

This option will only be available if a specific number of whole numbers has been specified in the previous option. If the value resulting from the formula does not reach the specified whole number, the remaining spaces will be padded with zeros



This option will be available only in the event that a specific number of decimal places has been selected in the previous option. If the value resulting from the formula does not reach the specified whole number, the remaining spaces will be padded with zeros

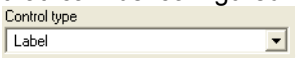
Will display a thousands separator in the value resulting from the formula. This separator will depend on the regional configuration of the system where the program is running.



Here the formula that will produce the result to be displayed on the report page is specified. It can be entered manually or using the "*wizard*" button (see 10.1.1 Expressions and Conditions Creation Wizard).

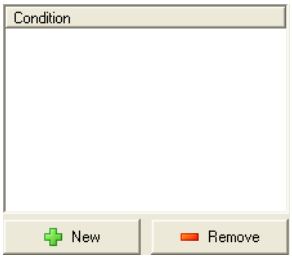
This will display a zero instead of a dash if the expression cannot be evaluated.

6.2.1.6 Conditioned control

This tool will allow us to include both a control and the previously defined data (text label, image, formula ,date) in the report, that will be shown only during specified conditions. The properties that can be configured for this tool will depend on the type of control which has been chosen in 

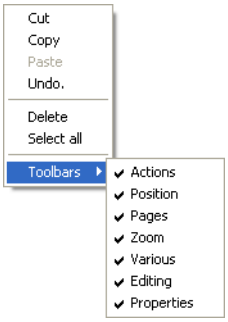
. The common options will be:

Here the condition which gives rise to the appearance of the chosen control on the report page is specified. It can be entered manually or using the "*wizard*" (see 10.1.1 Expressions and Conditions Creation Wizard)



Once the condition has been specified, click the 'New' button and the condition will be added to the condition list. To delete a condition from the list just select it and push the 'Delete' button. When there is more than one condition on the list, the control will activate when one of more of them is complied with.

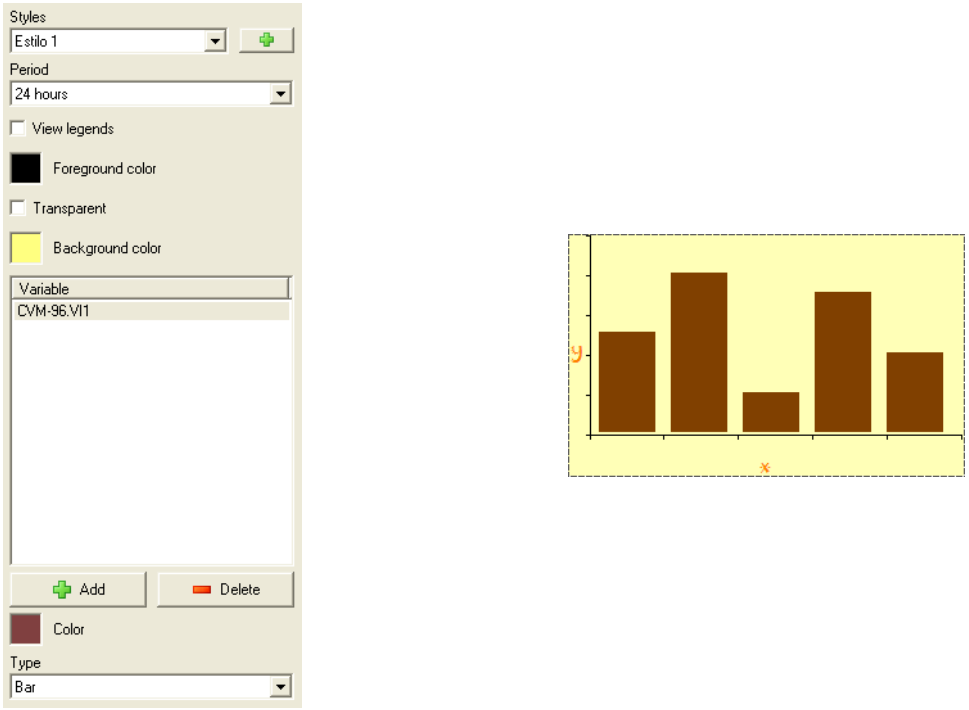
Right click on the report page to cut, copy, paste, delete, select all the controls or show or hide the toolbar.



6.2.1.7 Embedded Graph Control

Use this tool to embed a graph in a report. This control, like others, can be placed anywhere in the report and enables a large number of variables to be viewed.

The style of the text, axes and keys (i.e., font, size, color, etc.), may also be configured. The variable keys, axis color, background color (it can also be transparent) and the variables to be represented may be displayed or hidden.



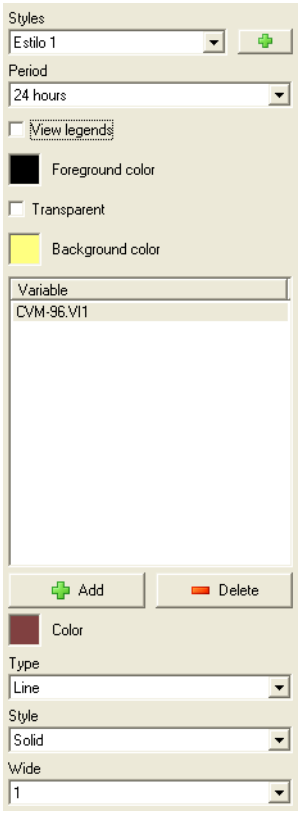
Embedded graph control properties and control representation

The color and type of representation for each variable may be chosen. The choices are bar graph, lines or points. For scatter type representations we can select between dots, circles (5x5), squares (5x5), diamonds (5x5), X (5x5), Crosses (5x5), Xs (3x3) and Crosses (3x3). Also, for the line representation, the style can be chosen (solid, dashed, dotted, line-dot and line-dot-dot) as well as thickness (between 1 and 10 points).

The most important parameter, apart from the variables to be represented, and that will determine the final aspect of the graph (and, most importantly, the amount and distribution of information to show), is the period of time.

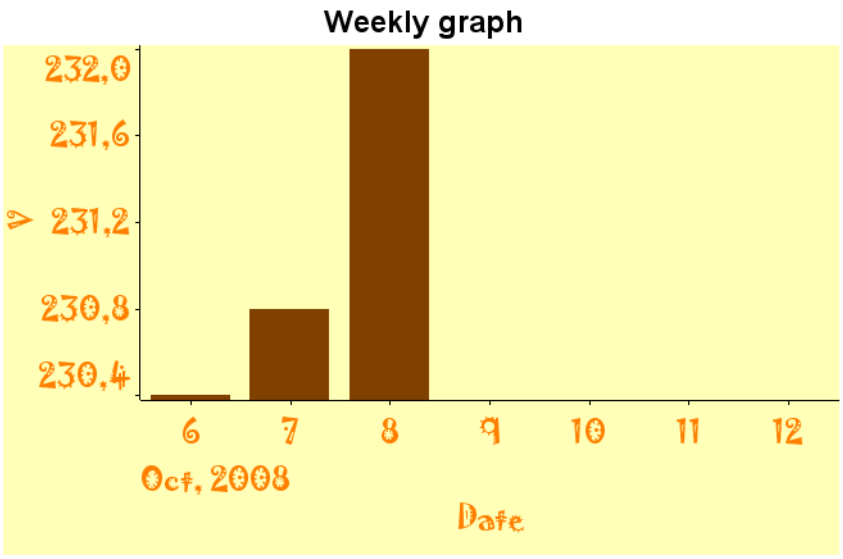
The period can be automatic, 5 minutes, 10 minutes, 15 minutes, 20 minutes, 30 minutes, 1 hour, 1 day and 1 month. In the event that the period is automatic we can choose the number of values of the variables that make up the graph we want to see.

There is a fundamental difference between choosing the automatic period and any other period. The automatic function groups the data according to the graph period. So, for example, if the graph period is one week, the values of all variables to be represented will be grouped into a single value for the graph. It is therefore necessary to indicate the number of periods to be displayed, and these periods must always be prior to the report period. Thus, a monthly report with an embedded graph, an automatic period and 6 values, will produce a graph with values grouped by month, displaying the month of the report (last value) and the previous five months. If automatic is not chosen, the values represented will be grouped according to the period specified, and only those included in the period of the report will be included. For example, a weekly report with an embedded graph that has a one day period, will produce a graph of the week's report with the values grouped by days (typically 7 values). With a period other than automatic, values that are not included in the report period are not shown, whereas the automatic option allows the display of values prior to the report period.



Properties of an embedded graph with an automatic period

Once generated and displayed in the client, the graph might look like this:



6.2.1.8 Analogue bar control

Use this tool to include an analogue bar in a report. This control, like others, can be placed anywhere in the report and enables a large number of different variables to be viewed.Select this tool and draw a selection box on the report by keeping the left mouse button pressed. The following properties may be configured from this control:

Selection of values to be viewed in the control, maximums, minimums or both.

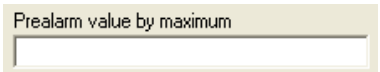
Indicates the orientation of the control between horizontal or vertical.

Indicates where to display the control value label: above, below, left or right.

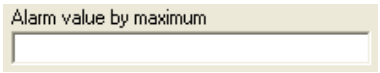
Select the variable that the control will monitor.

Indicate the maximum value the control can display.

Indicate the minimum value the control can display.

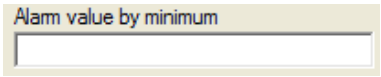


Indicate the maximum prealarm value the control can display.

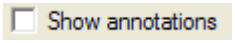


Indicate the maximum alarm value the control can display.

Indicate the minimum prealarm value the control can display.



Indicate the minimum alarm value the control can display.



Indicate whether or not messages relating to alarm and pre-alarm values are displayed in the control.

6.2.1.9 Common options for action tools

Any control entered in the report sheet can be re-sized and moved. To re-size a control just place the mouse pointer on one side of the rectangle which surrounds the control and keep it pressed down while moving it in the desired direction. To move a control left click and hold while dragging the mouse in the desired direction. Move multiple controls by grouping them inside a selection box. Left click and hold to group two or more controls, drawing a selection box including the desired controls within.

6.2.2 Position tools”

Horizontally center: This function requires at least one control to be selected. Using the selected control as reference, one or more other controls situated on the report sheet can be aligned horizontally. The control or controls will move to the left or the right to end up completely aligned on the page. If this option is used with the “*Control*” button pressed each of the controls selected will be aligned independently.

Vertically center: This control requires at least one control to be selected. Using the selected control as reference, one or more other controls situated on the report sheet can be aligned vertically. The control or controls will move up or down to end up completely aligned on the page. If this option is used with the "*Control*" key pressed each of the controls selected will be aligned independently.

Horizontally re-size: This function requires at least two controls to be selected. The horizontal size of a control can be aligned to another existing one using this tool. Hold down the 'Control' key while left clicking the controls to be re-sized. The last control selected will used as a reference for re-sizing the others, i.e., all the selected controls will end up with a horizontal dimension equal to the last control selected.

Vertically re-size: This tool operates in the same manner as horizontal re-sizing but with reference to the vertical size of the last control selected.

Re-size vertically and horizontally. This tool will re-size horizontal and vertical dimensions simultaneously.

Redistribute space horizontally: This function requires at least three controls to be selected. The horizontal position of selected controls can be adjusted to place them equidistant from each other. I.e., controls to which this tool has been applied will be spaced evenly left to right.

Re-distribute space vertically: This tool operates in the same manner as the horizontal space redistribution but with reference to the vertical re-distribution.

Align left: This function requires at least two controls to be selected. Aligns controls according to the left most part. Hold down the 'Control' key while left clicking the controls to be re-aligned. The last control selected will used as a reference for re-aligning the others, i.e., all the selected controls will end up aligned to the last control selected..

Align right: This tool operates in the same manner as the left align but in the opposite direction.

Align top: This function requires at least two controls to be selected. This function enables alignment of the upper edges of controls. Hold down the 'Control' key while left clicking the controls to be re-aligned. The last control selected will used as a reference for re-aligning the others, i.e., all the selected controls will end up aligned with the top edge of the last control selected..

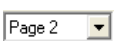
Align bottom: This tool operates in the same manner as top align but with reference to the bottom edges of controls.

6.2.3 Pages tools

Add page: Use this tool to add a new page to the report. Reports can have multiple pages with separate content. Each of these pages is linked to a single report and the only common element between different pages are formulae.

Delete page: Use this tool to delete the active page.

Forward / Back: Use these tools navigate through a report containing more than one page.



Using this control will directly show a page of the report without having to progress page by page with the tools described above. Clicking the control opens up a list of pages available for the active report.

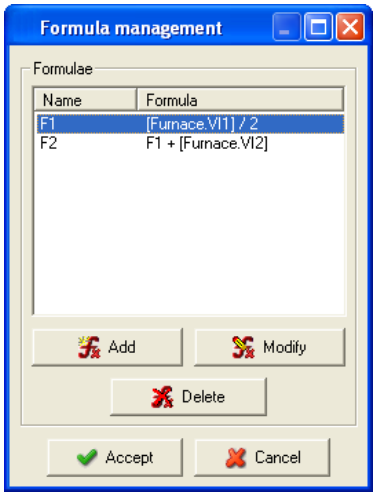
6.2.4 Zoom tools"

Zoom in/Zoom out: Using these tools you can zoom in or out from the image that is currently defined for the report page display.

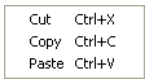
Use this control to indicate a specific zoom to implement on the report page. The values range from 50% to 1000%. Use 'Fit to page' mode to adapt the zoom to the report sheet being displayed, to appear as large as possible given the screen resolution where the program is running.

6.2.5 Miscellaneous tools"

Configure formulas: Use this tool to define formulas, which may be applied to or referenced in any of the report pages for which they have been defined. The following window will appear when the button is clicked:

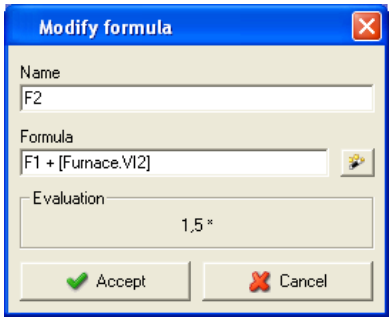


Right click the list of formulas and the following contextual message will appear



enabling cutting, copying, or pasting variables in the active report, as well as enabling formulae to be copied between different reports or SCADA screens. Some of the options from the context menu may not appear. Copy will only appear if there is a style selected, and the paste option only if the styles have been copied onto the clipboard. If no formulae are selected and there are no formulae on the clipboard when the right button is clicked the context menu will not appear.

Click '*Delete*' to eliminate the selected formula. Click '*Add*' or '*Modify*' to open the formula modification window:



10.1 Expressions and conditionsUse to name and detail formulae (see appendix 14.2 Expressions and conditions). Formula names cannot contain certain types of special characters nor contain reserved words. 10.1 Expressions and conditionsReserved words are those that match the name of an available function (see appendix 14.2 Expressions and conditions).

Horizontal/Vertical Orientation: This tool enables the orientation of the report sheet to be defined. Controls do not reorganize when changed from horizontal to vertical or vice versa. So some may end up invisible by virtue of being covered by another. However, these controls have not been deleted, and if the change is reversed they will become visible again.

6.2.6 "Editing" tools.

2.1 File Menu 2.3 Edit MenuThese tools carry out the same operations as the options from the *'File'* and *'Edit'* menus. See sections 2.1 File Menu and 2.3 Edit Menu.

Save. Use this tool to save changes made to the report.

Save as: Use this tool to save a copy of the report with a different name.

Cut: Use this tool to copy selected controls to the clipboard and delete them from the report. The same operation may be performed using the "Control" + "x" keyboard command

Copy: Use this tool to copy selected controls to the clipboard. The same operation may be performed using the "Control" + "c" keyboard command

Paste: Use this tool to paste the clipboard contents to the report. The same operation may be performed using the "Control" + "v" keyboard command

Undo: Use this tool to revert recent changes to a previous state. The same operation may be performed using the "Control" + "z" keyboard command

Delete: Use this tool to delete controls in the report.

Select all: Use this tool to select all report controls at once. The same operation may be performed using the "Control" + "e" keyboard command

Search: Use this tool to find specific text in report.

Replace Use this tool to replace specific text in a report with different text.

7 Scada[3]

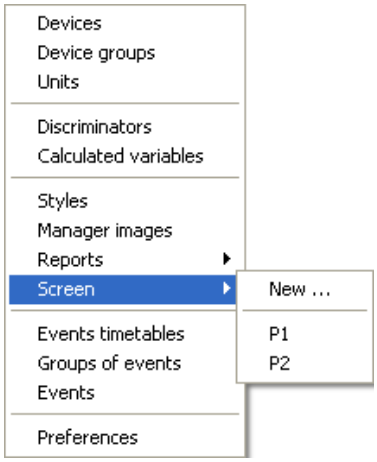
SCADA allows display of one or more windows, with or without a background image, incorporating display control, turning the PC into a powerful and versatile synoptic panel of the installation.

The aim is to generate an application, consisting of one or more screens, which can run independently in a designated facility.

A standard application would consist of a main screen serving as a basis for others that will appear according to given requirements. The number of screens is only limited by the conditions existing on the PC where the program is running.

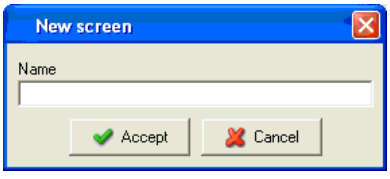
7.1 Add / Remove screen

To create, modify or delete screens in the SCADA Click the '*screen*' option in the '*Setup*' menu. Several options will appear, depending on whether or not SCADA screens have been previously created.



As can be observed in the figure, the option '*New*' will appear, which will enable a new screen to be created, followed by the name of the screens that have been created until the present (if any). Right clicking on any of the screens already in place will display options for modifying names and removing the screens.

In the case of selecting the '*New*' option a window will appear where the name of the new report to be created can be chosen. This name will uniquely identify the screen in the SCADA system.



Select '*new*' or any already existing screen and a SCADA screen design window will open.

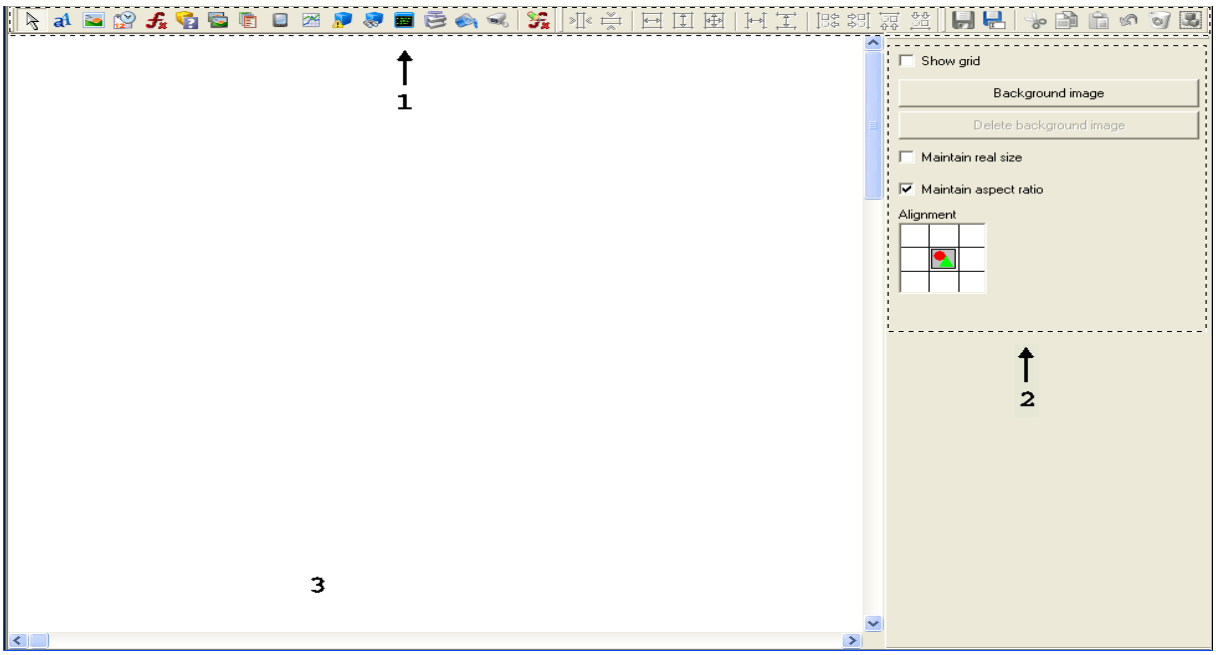
[3] Only in SCADA and Deluxe versions

7.2 Editing SCADA screens

Use this function to add, change or delete screen controls. Use these controls to display the value of a variable, perform an action, paint an area of the screen, and so on.

The purpose of the screen is to display the status of the installation in a simple manner, allowing the situation on the different lines in the plant to be viewed, display the installation electricity variables, etc. The screen controls make this possible.

The edit window of the SCADA screen looks like this:



The window is divided into three areas:

- Tools (1)
- Information panel (2)
- SCADA screen (3)

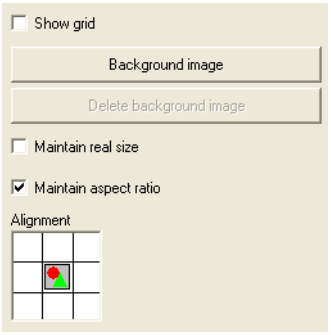
The tools permit a simpler configuration of the SCADA screen design.

The information panel allows access to all the configuration options of a selected control being added to the design of the SCADA screen.

The SCADA screen is the design view from which the controls are implemented.

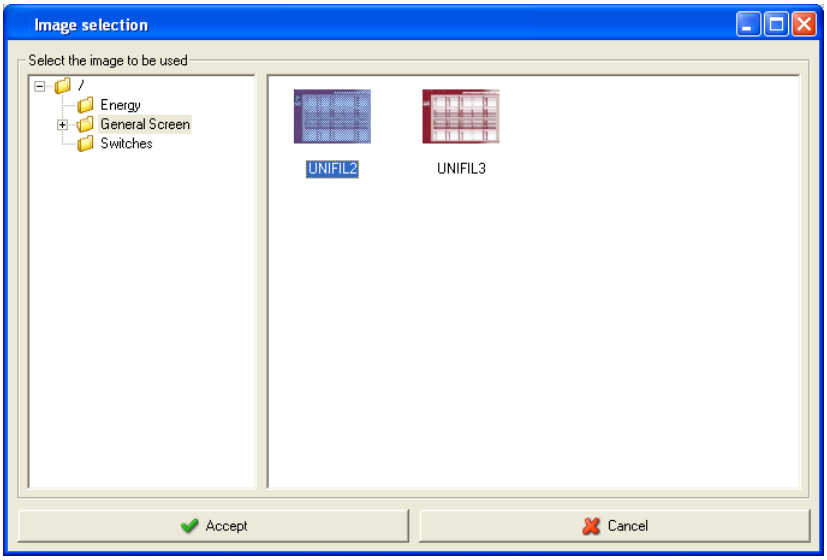
Thus, using the tools (1) controls may be entered on the SCADA screen (3) whose properties may be configured in the information panel (2).

When creating a new SCADA screen, its background configuration properties will appear by default on the information panel.These properties are the same as those which appear when no control selected.



Show grid The '*Display grid*' option displays or hides the grid, which indicates the position of objects on the screen. If the grid is shown, the object will be automatically aligned to the grid.

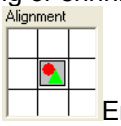
Background image Select this option to add an image from the image manager (see section 2.2.7 Image manager) so that it can appear in the report background.



Delete background image Click on this button to delete the present background image.

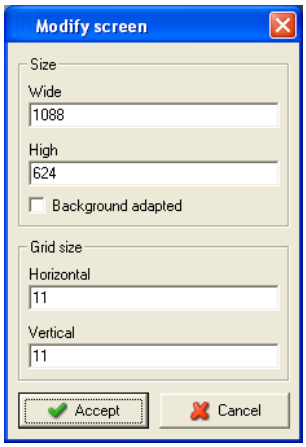
Maintain real size If this option is enabled, the background image is displayed in its actual size. If disabled the background image will be stretched or fit to the margins of the SCADA screen.

Maintain aspect ratio If enabled, this option will maintain the aspect ratio of the selected background image. If disabled it will force the image to occupy the entire width and height of the SCADA screen expanding or shrinking its measures as appropriate.



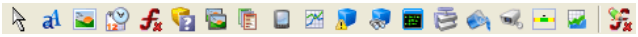
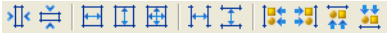
Enables the selected background image to be placed in any of the seven positions shown in the figure.

Options This button (situated in the upper toolbar) allows configuration of the grid characteristics as well as the size of the SCADA screen being detailed:



The width and height of the screen is measured in pixels and the size of the grid will specify, in pixels, the distance between a point on the grid and another in horizontal or vertical. If a background image has been selected, the size of the SCADA screen can be adapted to the size of this background by checking box

In terms of tools, there are several grouped according to their use:

- Action tools 
- Positioning tools 
- General tools

7.2.1 Action tools

6 ReportsThe following action tools actions have already been explained in Chapter 7 Reports.

- *Select controls:* See section 6.2.1.1
- *Text control :* See section 6.2.1.2
- *Image control:* See section 6.2.1.3
- *Date Control :* See section 6.2.1.4
- *Formula control:* See section 6.2.1.5
- *Conditioned control:* Operates in the same way as conditioned control in the reports but also lets the IP camera control be added. See section 6.2.1.6
- *Embedded graphic control*: see section 6.2.1.7
- *Analogue bar control*: see section 6.2.1.8
- *Configure formulae:* See section 6.2.5

In the *date control*, please note that it is not possible to select '*Initial date* and *End date*' as they are meaningless on the SCADA screens.

7.2.1.1 Screen control

This tool creates access to one SCADA screen from another SCADA screen. The following properties may be configured from this control:

Here the destination screen which will be accessed by clicking on the control entered on the SCADA screen is specified.

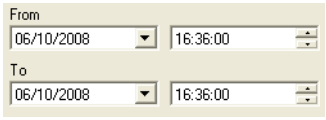
Here the appearance of the control on the SCADA screen is specified. Select 'button', 'image' or 'text'.

7.2.1.2 Report control

6By selecting this option, the control will become direct access to a previously defined report (see Chapter 7). The options available are:

Select the report to be displayed from the client screen.

The group type for the data to be displayed in the report can be chosen. If the "User Defined" option is selected, the following fields will appear



Here the report period is specified.

Here the appearance of the control on the SCADA screen is specified. Select ‘button’, ‘image’ or ‘text’.

7.2.1.3 Device Control

When this option is selected, the control will become a direct access to the screens that show the variables of a device. The options available are:

Use the drop-down menu to select the device whose variables screen will be displayed upon clicking on the control from the client screen.

Here the appearance of the control on the SCADA screen is specified. Select ‘button’, ‘image’ or ‘text’.

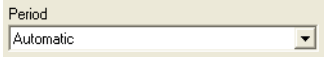
7.2.1.4 Graph / Table Control

Use this option to make a graph or a table of one or more variables from one or more devices. The options available are:

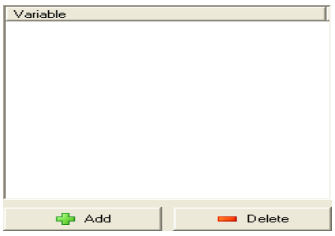
A choice between graph and table.

Choose the desired graph or table type.

The group type for the data to be displayed in the graphs or tables can be chosen.



In the same way the sample period can be specified for graphs or tables.



Here the variables that are represented by a graph or a table can be added. Clicking the 'add' button to select the desired variables.

Once selected, the variables will appear on the list and may be deleted by the

button

Here the appearance of the control on the SCADA screen is specified. Select 'button', 'image' or 'text'.

7.2.1.5 Active Events Control

Use this option to make the control a short cut to the active events display window.

Here the appearance of the control on the SCADA screen is specified. Select 'button', 'image' or 'text'.

7.2.1.6 Event Viewer Control

Use this option to make the control a short cut to the stored active events display window. The options available are:

This corresponds to the event group records to be filtered.

The group type for the data to be displayed in the events viewer can be chosen.

The list may be displayed either complete or not.

Here the appearance of the control on the SCADA screen is specified. Select 'button', 'image' or 'text'.

7.2.1.7 Run control

Use this tool to include access from the SCADA screen to another application in the system. The properties than can be configured from this control are:

Specify the complete path to the application that will be called up when the control entered on the SCADA screen is clicked. For example: C:\WINDOWS\SYSTEM32\CALC.EXE.

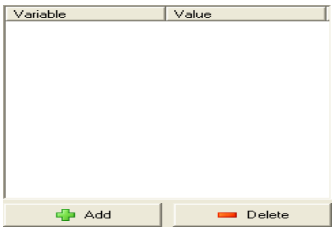
Specify parameters (if needed) to be added to the application call indicated in '*Program*'.

Here the appearance of the control on the SCADA screen is specified. Select 'button', 'image' or 'text'.

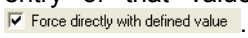
7.2.1.8 Force Variable Control

Use this tool to force variable values that can be forced, as in equipment with digital outputs. The properties than can be configured from this control are:

Here the variable whose value will be forced is specified. It can be entered manually or using the "*wizard*" button (see10.1.1 Expressions and Conditions Creation Wizard).



Once the variable has been specified, click the '*New*' button to this variable to the list of forced variables. To delete a variable from the list just select it click '*Delete*'. All variables on the list at the moment the control is clicked from the client will be forced to the status established in each of them, which is defined below.

Specify what action to take when the control is enabled from the client (open or close). This selector will appear if there is a specific value list for the variable values to that are possible to force, (e.g., for digital output the options will be open or close). If on the contrary, the variable may be forced to any value (for example a counter) a field will appear to permit manual entry of that value. This selector will only be enabled when the following box is checked 

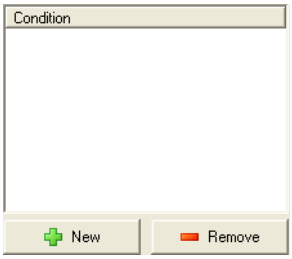
. if this box is not checked the value that will appear in the control will be that defined by the user from the screen in the Java Client

Here the appearance of the control on the SCADA screen is specified. Select 'button', 'image' or 'text'.

7.2.1.9 Fill Control

Fill control allows color changes to homogeneous backgrounds, or background images, (with all the same color pixels) regular or irregular. mark the pixel point where fill area will begin in edit mode. Chang the color of the area starting with the pixel marked by the point during the creation of the control. It will not be displayed from the client. The properties than can be configured from this control are:

Here the condition that has to be met is specified so that the application paints the area with the chosen color. It can be entered manually or using the del "*wizard*" (see Expressions and Conditions Creation Wizard).



Once the condition has been specified, click the '*New*' button and the condition will be added to the condition list. To delete a condition from the list just select it or press the '*Delete*' button. When there is more than one condition on the list, the control will activate when one of more of them is complied with.

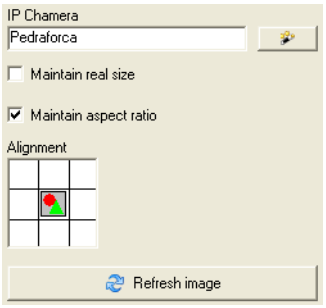
Will allow the fill color to be applied.

If this box is enabled, a simulation of the final outcome of the fill control will be shown, painting the area to be painted as it would appear from the client.

The control tolerance may also be set, with a maximum of 1000.

7.2.1.10 IP camera control

Use the IP camera control to add an image of one of the system cameras in any area of any SCADA screen. The image is refreshed in real time. The properties of this control are as follows:



IP camera control property area

Use to indicate which camera will supply the image feed, as well as the properties to be applied to those images relative to the control size (these properties are equivalent to those available for controlling still pictures).

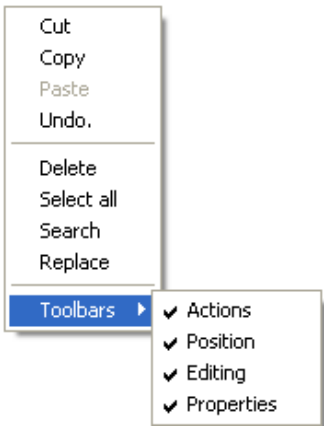
IP camera control representation in the SCADA screens editor

Use the "refresh image" button to obtain and display the last available table of the camera, to verify the image arrives properly and that the image adjustment properties are properly configured.

IP control camera representation with the image refreshed.

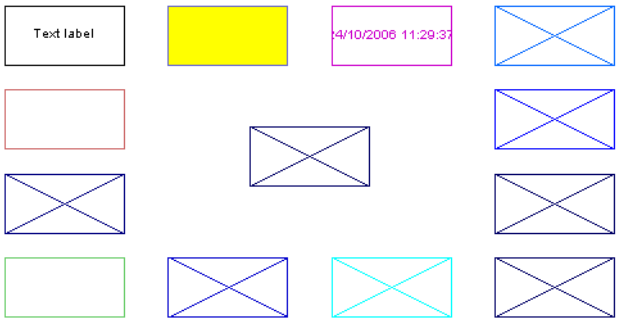
7.2.1.11 Common action tool options

Right click on the SCADA screen to add controls. In the same way, the toolbars can be displayed or hidden:

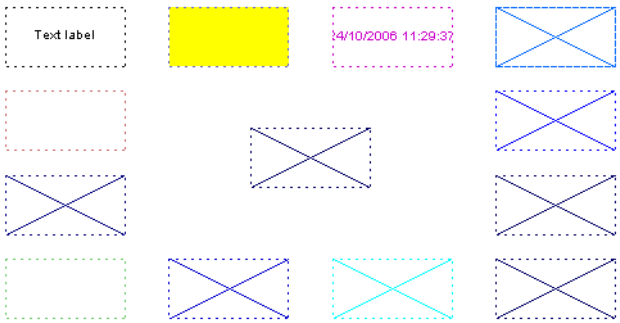


Any control placed on the SCADA screen may be resized and moved. To re-size a control just place the mouse pointer on one side of the rectangle which surrounds the control and hold down while moving it in the desired direction. Left click and hold on a control to drag it to a new position. Move multiple controls by grouping them inside a selection box. Left click and hold to group two or more controls, drawing a selection box including the desired controls within.

Controls entered into a SCADA screen present the following aspect in normal mode:



When controls are selected a dashed line is shown around them:



7.2.2 Positioning tools

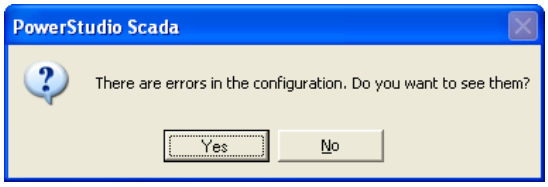
6.2.2 Operation of positioning tools is the same as that explained in Chapter 7.2.2 but applied to SCADA screen controls.

7.2.3 Editing Tools

6.2.6 Operation of positioning tools is the same as that explained in Chapter 7.2.2 but applied to SCADA screen controls.

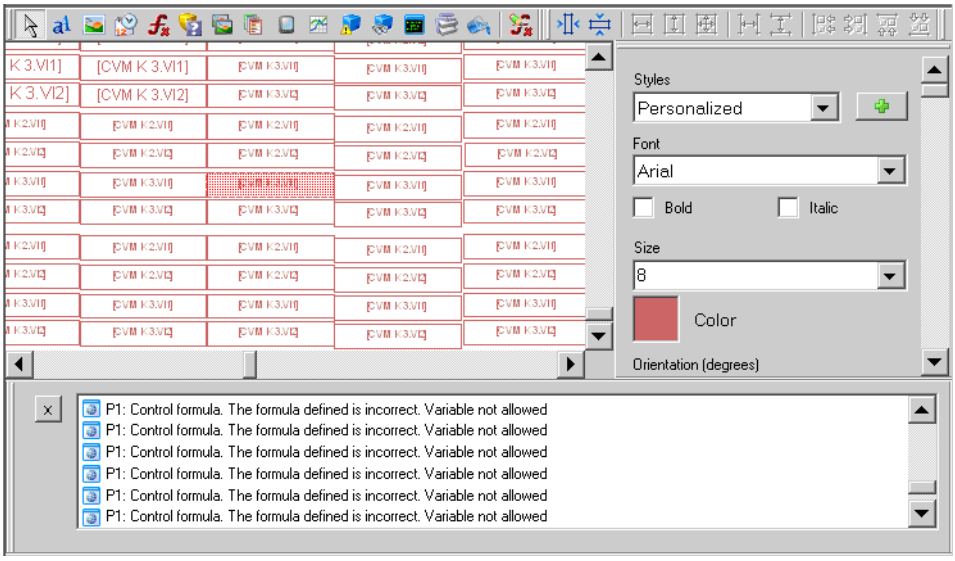
8 Error detection

When an application is exported to the communications engine, PowerStudio verifies that its configuration is correct, verifying possible errors in the SCADA screens, reports, etc. Once the entire verification has been performed, if there is any error, PowerStudio will offer the option to view and correct them.



If you do not want to see errors, the active application will be sent to the communications engine without modification, but it may not behave as desired on those controls that contain errors. For this reason, checking for errors is recommended.

An example of a screen with errors would be:


[CVM K 3.VI1]
[CVM K 3.VI2]
Styles
Personalized
Font
Arial
Bold
Italic
Size
8
Color
Orientation (degrees)
P1: Control formula. The formula defined is incorrect. Variable not allowed
P1: Control formula. The formula defined is incorrect. Variable not allowed
P1: Control formula. The formula defined is incorrect. Variable not allowed
P1: Control formula. The formula defined is incorrect. Variable not allowed
P1: Control formula. The formula defined is incorrect. Variable not allowed
P1: Control formula. The formula defined is incorrect. Variable not allowed

The list below shows errors found. The report includes the resource name and type and a brief explanation of the error found. The different types of resources are

- SCADA Screens
- Reports
- Events

Double left click an error line to display the SCADA screen, report or event where the error was found. If it is a SCADA screen control it will select the control where that error was detected.

9 Events[4]

You may add, modify or delete various events of use in warning of possible dangerous or exceptional states in the installation.

The events may be reported. In this case the events will be shown from a Java client by means of a pop-up screen when enabled, and remain on screen until they have been acknowledged and disabled.

In addition for each event a disabled schedule may be defined. That is, periods during which the event is disabled can be defined, and the software will ignore them during that time.

You may also associate a note each time that the event is enabled, for example to save the value of a variable which has caused the event.

Finally, for each of the possible states of the events, a series of actions can be defined that the software will execute while the event is found in each one of these states. Possible states are:

- *Activation:* Will be produced when the event condition occurs. For example, where a value has exceeded a certain limit.
- *While enabled:* This will be produced while the condition is in force, once the event has been enabled.
- *Acknowledgement:* Occurs when the operator acknowledges an event. This state is only possible if the incident is reported.
- *Disable or restore:* Occurs when the event condition in force. For example: If the condition is defined as a variable exceeding a certain value, disabling will occur when it ceases to exceed that value.

The system event set up consists of event disabled schedules, event groups and the events themselves. 9.3 Event configurationIf you have no need to define groups of events or event disabled schedules go directly to section 10.3 Event Configuration.

Both schedules and groups can be defined before or after the definition of the events themselves. However if you need to define calendars we recommend this be done first so they can be assigned to the events when creating them for the first time. Similarly, if you know which groups of events are to be configured, they should be defined before creating the events, so they can be assigned directly on creating each event.

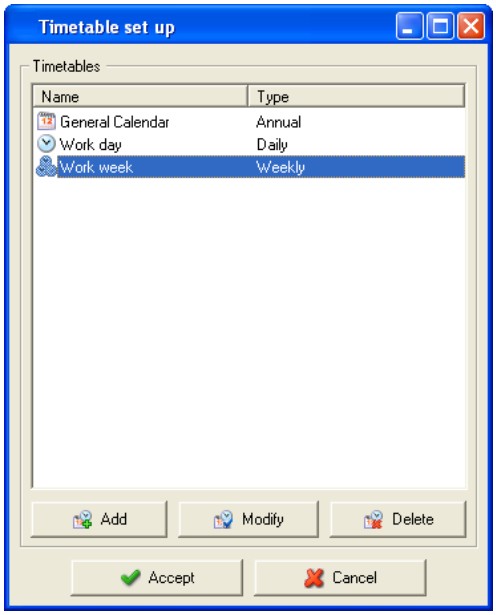
[4] Only in SCADA and Deluxe versions

9.1 Events schedules

For each event a disabled schedule can be defined. In this schedule the times when the event will be ignored are marked. 9.3 Event configurationIf you do not want to disable the events you can go directly to 10.3 Event configuration.

In this schedule the times when the event will be ignored are marked. If no disabled calendar is configured the event will be taken into account and the program will monitor its status, assessing the condition configured in the event.

To configure events click the '*Events timetables*' option in the ' *Setup* ' menu. The following dialogue box will appear:



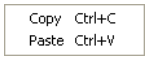
Here the different configured schedule periods are displayed. 3 different types of timetable can be configured

Daily: The disables periods for one day are configured.

Weekly: The disabled periods for one week are configured. For selection of different days of the week the previously configured "*Daily*" types are used.

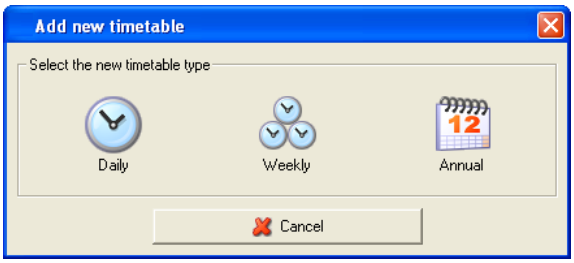
Annual: The disabled periods are configured using a calendar. As with the '*Weekly*' type, the days are selected from the previously configured "*Daily*" types.

Right click on the schedule list and the context menu will appear,



allowing schedules to be copied or pasted. Some of the options from the context menu may not appear. Copy will only appear if there is a style selected, and the paste option only if the styles have been copied onto the clipboard. If there are no timetables selected on the clipboard right clicking will not bring up the context menu.

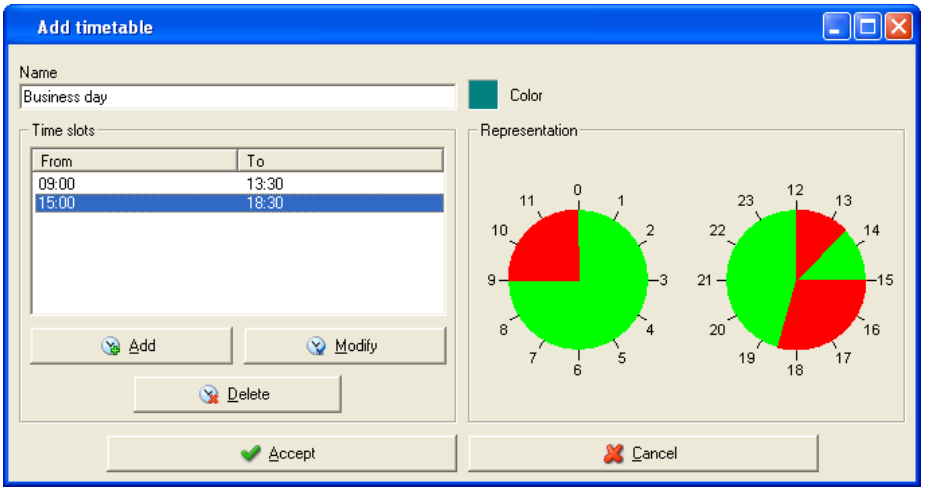
Click "*Add*" and the following dialogue box will appear:



Here the desired schedule type to be added is selected. Once added, the schedule type cannot be changed; that is if "*Daily*" is chosen, clicking the '*Modify*' allows modification of the "*Daily*" type, which cannot be converted to' *Weekly* 'or' *Annual*'.

9.1.1 Daily

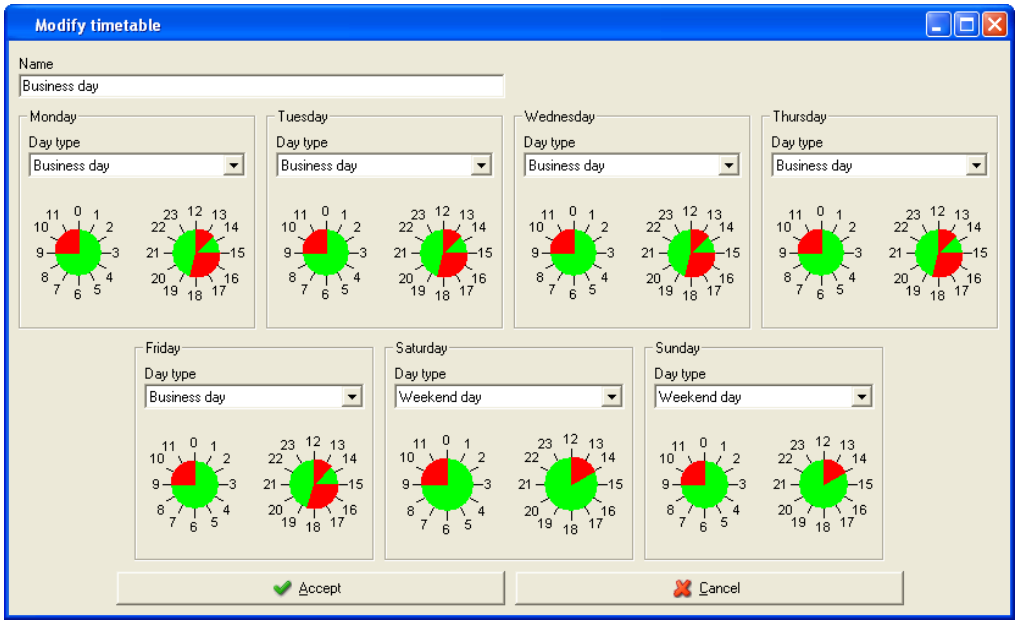
This schedule type corresponds to a day. In events that have a daily type selected, the disabled schedule will be the same for all days.



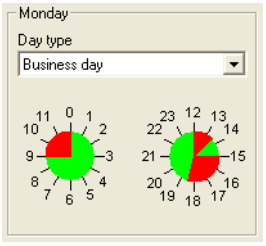
4.1.2 Day typesDay type configuration works in the same way as explained for filter day types (see section 5.1.2 Day types), except that there are no different hour types, but rather the schedule interval is established without taking into account the events (zones marked in red when showing the day).

9.1.2 Weekly

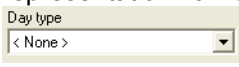
This schedule type corresponds to one week. In events that have a weekly type selected, the disabled schedule will be the same for all weeks.



Alphanumeric type data which enables the weekly type to be uniquely identified within the events timetable.



Configuration of each one of the 7 days of the week, where the 'type of day' selector contains the different types of days configured (see 9.1.1 Daily), showing the representation of the type of day selected. It is also possible not to select any day type

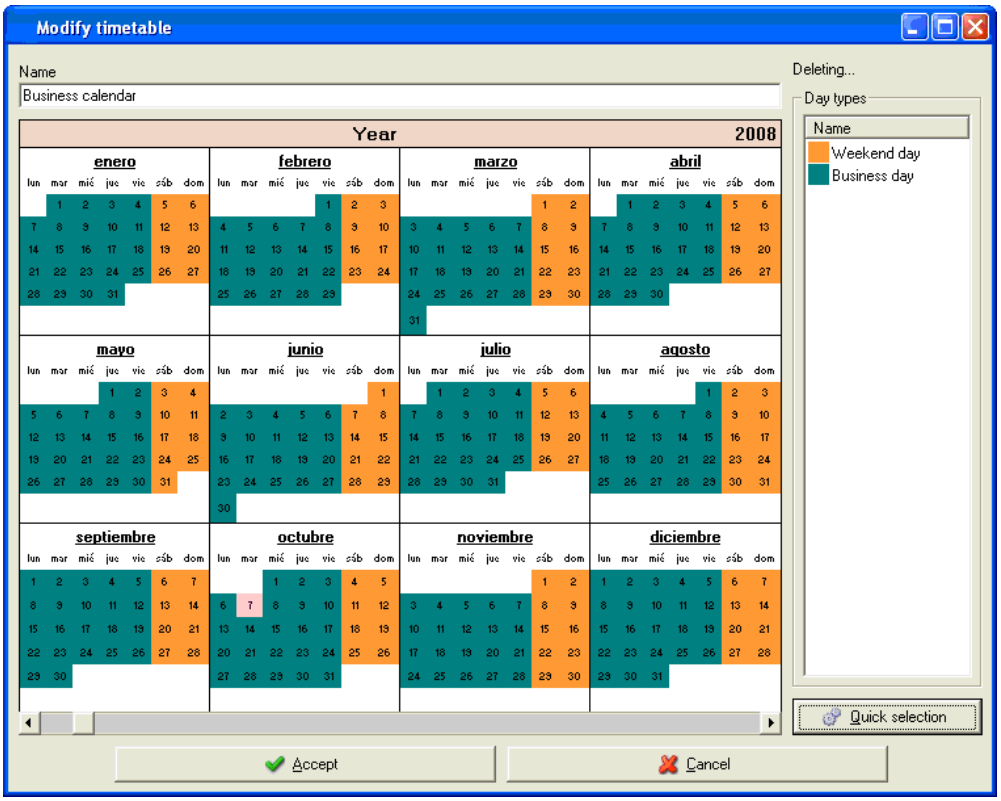


, in which case the event will not be disabled during the day.

9.1.3 Annual

This schedule type corresponds to a calendar, where different types of days can be configured for several years.

As with the weekly type, the different types of day that may be selected correspond to different configured daily types.

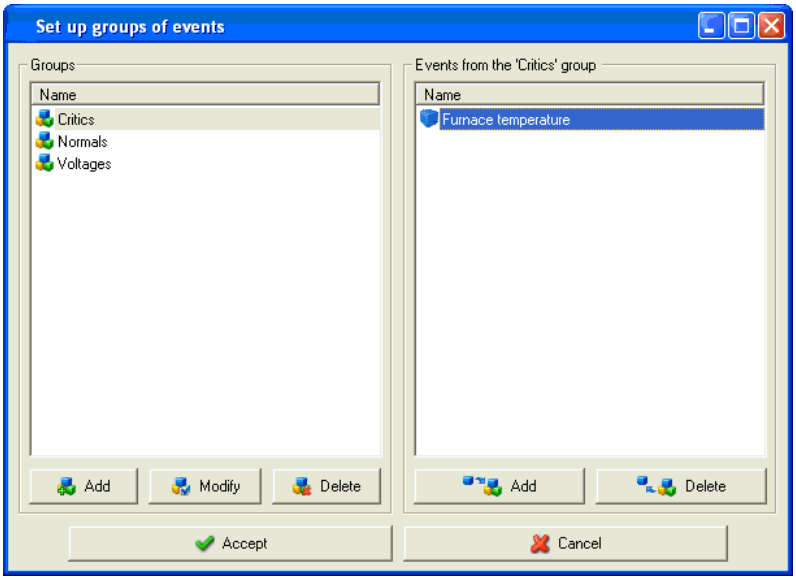


Alphanumeric type data which permits the type of year within the events timetable to be uniquely identified.

Calendar configuration is the same as that explained for the filter calendar (see 4.1.3 Calendar).

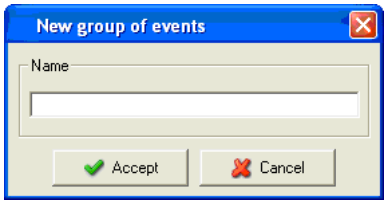
9.2 Event groups

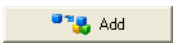
For a better display when it comes to showing the event viewer, allowing us to filter and show only one type of event, the events can be classified into groups, allowing a single event to be allocated to more than one group. The option 'Event groups' from the '*Set up* menu will allow the different event groups to be configured.



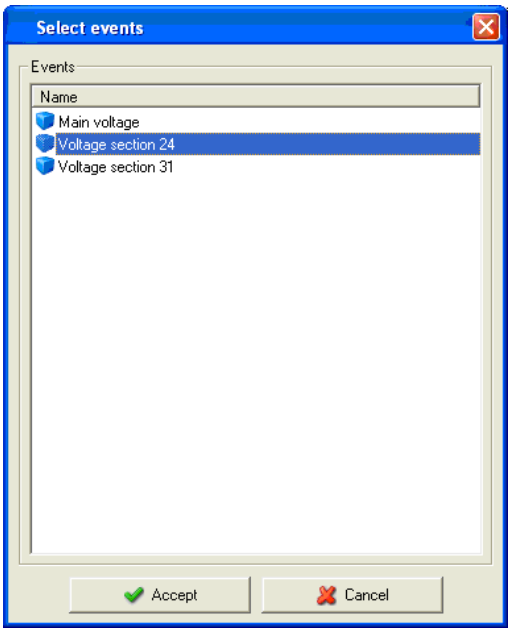
On the left-hand list all the configured event groups will be displayed, while on the right hand list events that have been assigned to the group selected from the list of groups will be displayed.

Allows us to add, modify or delete groups of events. On adding or modifying the following dialogue will appear:



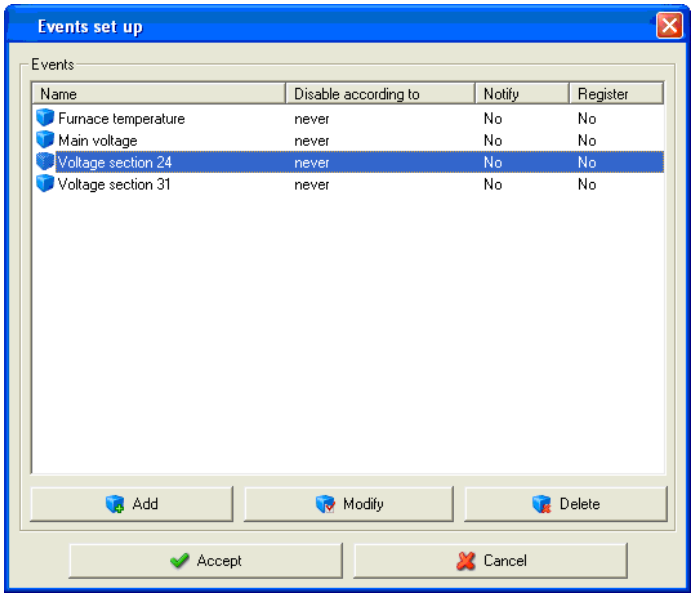
Here the name of the event is entered. This name uniquely identifies the group. 

Allows events from the group of selected events in the list of groups to be added or deleted. Deleting a group event will only delete it from the group and in no case will it be removed entirely from the event set up. When you click the '*add*' button a list with the events outside the group will appear, where events to be added can be selected.


Select events
Events
Name
Main voltage
Voltage section 24
Voltage section 31
Accept
Cancel

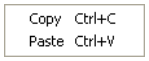
9.3 Event configuration

To add, modify or delete events, the '*Events*' option from the "*Set up*" menu should be selected. The following dialogue box will appear:



Here are shown configured events, the disabled schedule, and whether or not it will be reported and recorded.

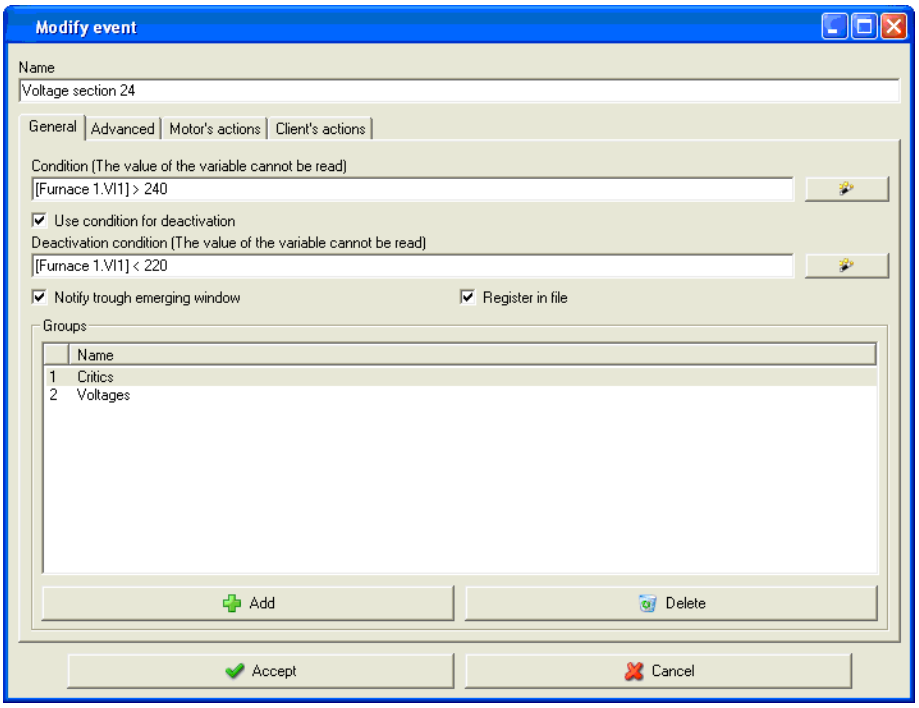
Right click on the list of events and the context menu appears.



Allowing events to be copied or pasted. Some of the options from the context menu may not appear. Copy will only appear if there is a style selected, and the paste option only if the styles have been copied onto the clipboard. If no event is selected and there are no events on the clipboard on right clicking will not bring up the context menu.

Clicking '*Delete*' will delete the events that are selected in the list of events.

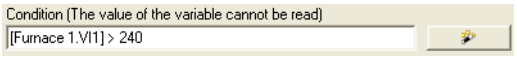
Clicking '*Add*' or '*Modify*' to create a new event or modify an existing event. The following dialogue box will serve to create or modify an event.



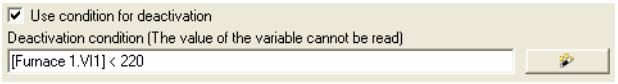
The functions of this dialogue are as follows:

Name that uniquely identifies the event in the application.

Allows switching between different event set up parameters. The previous image shows the general configuration of an event.



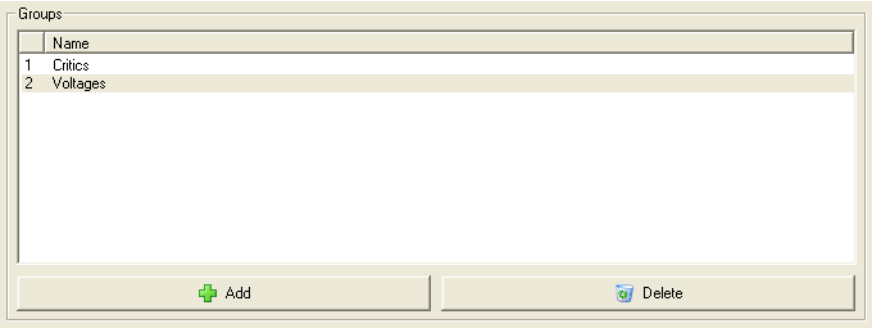
Event condition. The event will become enabled when the condition is true and will otherwise remain disabled. This can be entered manually or using the "*wizard*" button (see 10.1.1 Expressions and Conditions Creation Wizard)



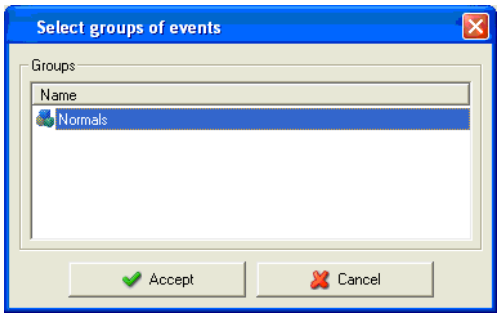
A condition for deactivation of the event can be added. Checking or unchecking this box this will enable or disable event conditioning. In this case the event will be enabled when the voltage exceeds 240 and is disabled at less than 220.

Checking or unchecking this box enables or disables event reporting. If the event is reported when the program is active a pop-up display will appear.

Checking or unchecking this box enables or disables event recording, which may be displayed in the events browser.

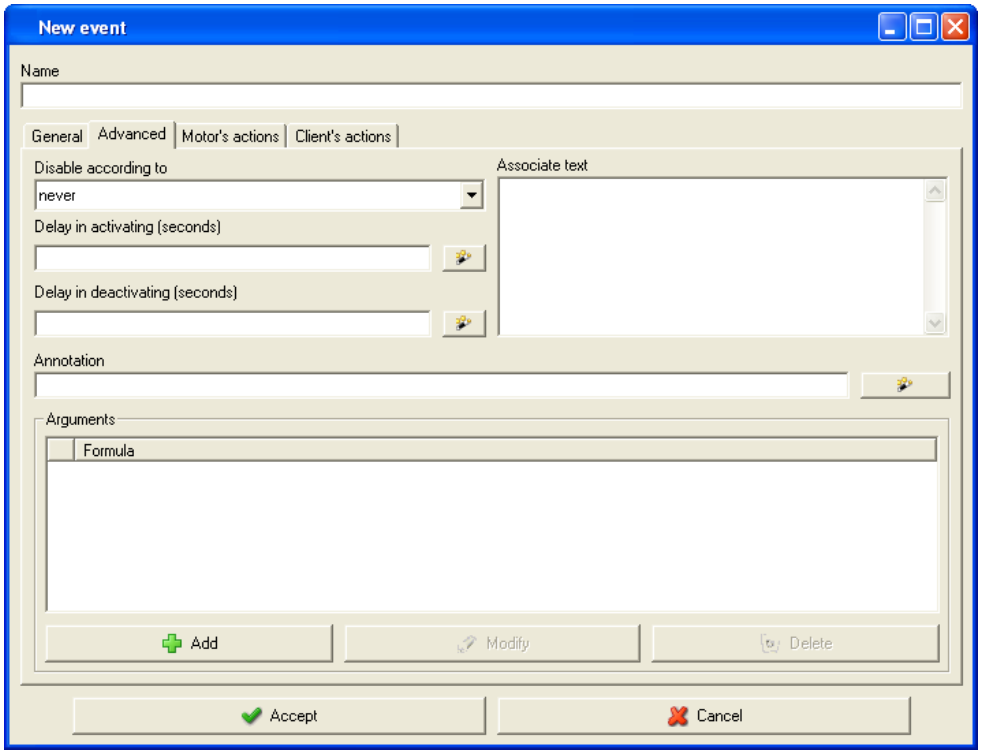


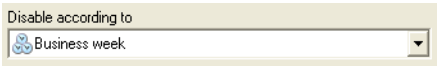
Shows the list of groups to which the event belongs (see 9.2 Event groups). Clicking on the 'Add' button brings up a dialogue with the list of groups that the event does not belong to, allowing the event to be added to additional groups.



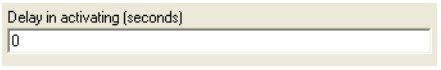
Use this dialogue to select groups to which the event can be added.

In the Advanced tab the following parameters appear



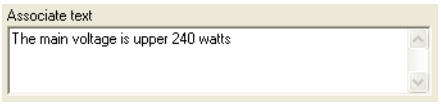


Allowing the event disabled schedule to be selected. If no timetable is selected, the event will be continuously monitored by the application. If an active event has a disabled schedule it will be disabled during the indicated time frame.



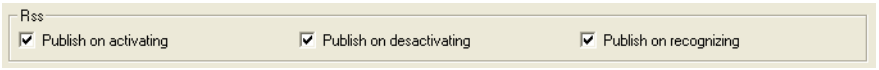
This value corresponds to the delay in seconds before event activation. The event will be enabled when the activation condition is met for at least the time taken to calculate the equation entered in this field at the time the event becomes valid. For example: if the equation for triggering the event is fulfilled, the delay in activation equation will be evaluated. If this equation provides a result of five seconds, the system will wait for this length of time to activate the event. If, during this delay in activation period, the event trigger condition is not met, the event will not be activated.

This value corresponds to the delay in seconds before event deactivation. The event will be deactivated, if active, when the activation condition is not met for at least the time indicated in the equation in this field (the time will be calculated based on the moment in which the event is no longer valid), in a similar way to the delay in activation.

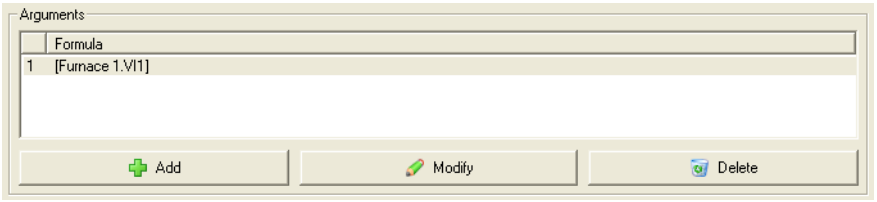


Brief description of the event.

Allows an annotation to be configured which will be calculated when the event is enabled and which may serve, for example, to ascertain the value detected of a variable that has enabled the event. 9.3.1 AnnotationThe annotations will be explained in more detail in section 10.3.1 Annotation.



Can be configured to generate Rss reports when enabling, disabling or acknowledging the event. In this case only the enabling and disabling of the event will appear. 2.2.13 PreferencesThis option will only appear if the Rss of events on the software preference screen has been enabled (see section 2.2.12 Preferences)



The arguments will allow formulas to be configured for their use in event annotation and actions. These formulas are calculated at the time of their use, being useful to display the value which has provoked the event as shown in the example.

The engine actions tabs allow the actions for each state of the event carried out by the communication engine to be configured, while for actions in the client application those actions to be carried out by the client application are configured. 9.3.2 ActionsThe actions are explained in more detail in section in section 10.3.2. Actions

9.3.1 Annotation

The annotation of an event is text, with a number of variable parameters, which is associated with the activation of an event.

The parameters will be replaced by their corresponding value when the event is enabled, hence, for two different activations of a single event two separate annotations may be made.

One of the uses of annotations is to record the value of a specific variable at the time the event is enabled, extra information can be displayed in the event viewer.

Below are the different parameters that may be used in the annotation.

Parameter	Description
%n	Name of event
%c	Event condition.
%s	Deactivation condition
%b	Delay in enabling
%e	Delay in disabling
%d	Name of disabled schedule
%t	Text associated with the event
%gx	Group Name x, where x is the order of the group within the list of groups. The order will be displayed with a number to the left of the name of the group.
%ax	Argument x, where x will be the order of the argument within the list of arguments. The order will be displayed with a number on the left side of the argument. The arguments are explained in more detail in section 9.3.1.1 Arguments.
%%	Character%

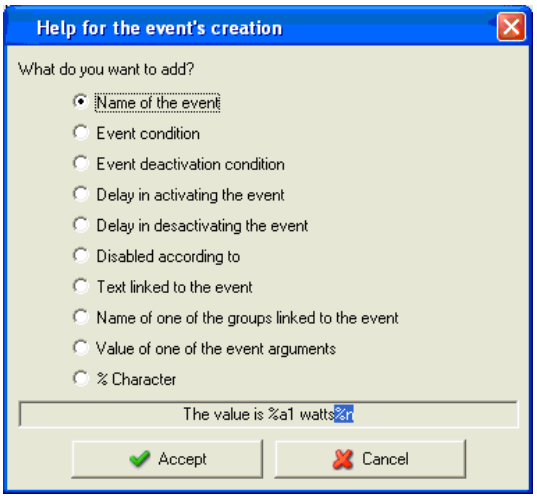
Each of these parameters will be replaced correspondingly when the event is enabled, for example if the annotation is:

Event name '% n' was enabled when the voltage marked %a1 V.

When the event is enabled the annotation created specifically for this activation will be:

Event name Main voltage was enabled when the voltage marked 256 V.

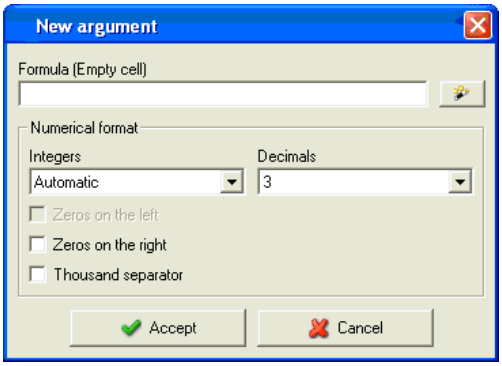
To facilitate creation of the annotation, click on the 'wizard' button and the following dialogue will appear:


Help for the event's creation
What do you want to add?
Name of the event
Event condition
Event deactivation condition
Delay in activating the event
Delay in desactivating the event
Disabled according to
Text linked to the event
Name of one of the groups linked to the event
Value of one of the event arguments
% Character
The value is %a1 watts
Accept
Cancel

Here you can choose a parameter to be added to the annotation.

9.3.1.1 Arguments

For the creation of the annotation a series of arguments can be defined. Each argument will consist of a formula and formula value representation format, as can be seen in the following dialogue:



Both the formula and the numerical format were previously described in 6.2.1.5 Formula control.

When the event is enabled, if the argument is used to create the annotation, the program will assess the formula and represent it in accordance with the configured format.

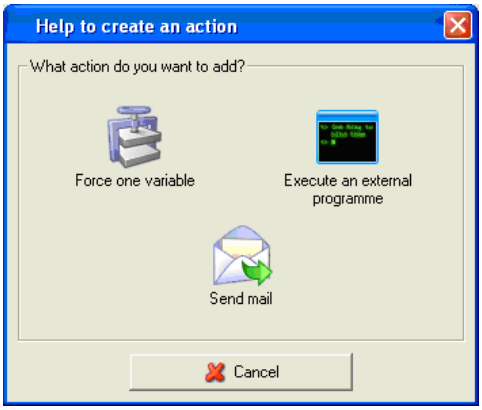
9.3.2 Actions

For each event a series of actions to be taken in each event status may be defined. You may formulate actions both in the communications engine and for the client application. However, depending on the action, it will only be possible on one of them.

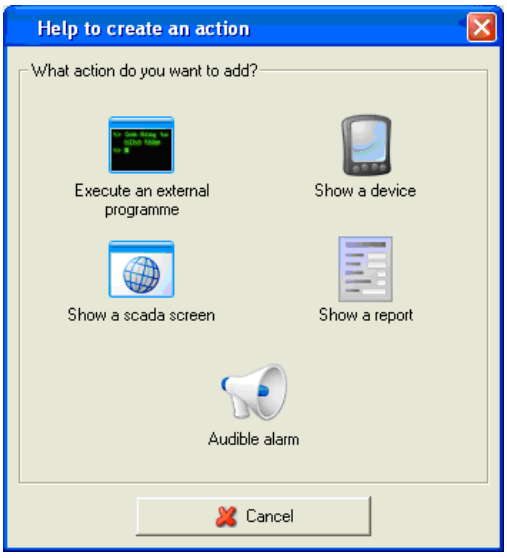
According to the event state the actions are divided into:

- *On activating:* These actions are executed only once when the event is enabled.
- *While active:* While the event is active, it will continuously execute this group of actions. Caution must be exercised in configuring actions, because they are running continuously they may block the system or connected devices.
- *On deactivating:* These actions are executed only once when the event is disabled.
- *When acknowledged:* These actions are executed only once when the operator acknowledges the event. This group of actions will only be available when the event must be reported.

By adding an action in the engine the following dialogue will appear:



Whereas if you want to add an action to the client the following will appear:

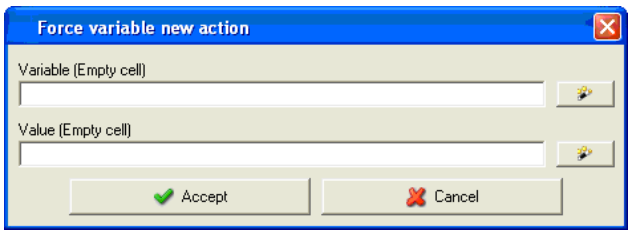


As can be seen actions that can be made by the engine are different from those that can be made by the client application. Bear in mind when adding actions, where they will be carried out. Once the action has been selected the corresponding window will appear for the configuration of these actions.

Because there are incompatibilities between actions, (e.g., it is not possible to show a device and a screen at once), adding non-compatible actions to the existing ones is not possible.

9.3.2.1 Forcing a variable

This action can only be done on the communications engine. It allows the value of a variable, such as a digital output or a counter to be changed.

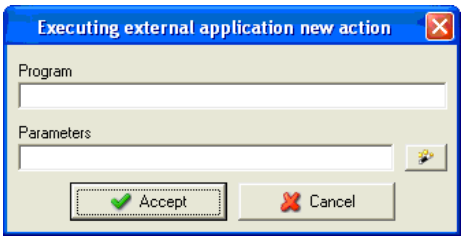


To configure the action one expression must be entered for the variable to be forced, and another for the value to which we wish to force the it.

Both the variable expression and the value may be entered either manually or using the corresponding '*wizard*'

9.3.2.2 Running an external program

This action may take place in both the communications engine and on the client application. Allows an external application, such as an audio file, which is present in the system to be executed.

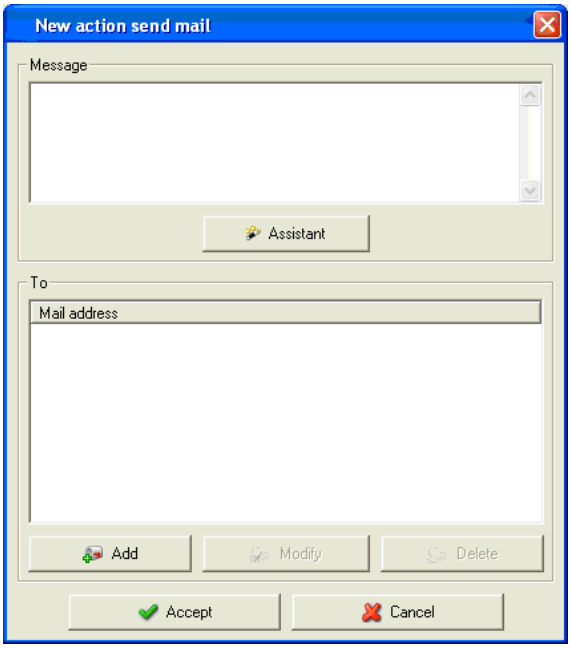


For correct operation it is advisable to indicate in the "*Program*" field the complete to the program so that the engine and the client application can find and execute it.

In the 'parameters' field the parameters necessary for the execution of the external application are entered, using the arguments configured in the event (see 9.3.1.1 Arguments)

9.3.2.3 Sending Mail

This action can only be done on the communications engine. It enables an electronic mail to be sent to the selected addressees.



In this dialogue the message to be sent in the mail is entered. The format of this message is similar to the event annotation (see 9.3 Event configuration) allowing any of the arguments configured in the event to be used. To facilitate entering the message the wizard can be used by clicking the button.

At the bottom a list of recipients to whom the mails will be sent appears.

For more information on how to configure the mail server see section 2.2.13 Preferences.

9.3.2.4 Show a device

This action can only be done on the client application. In conducting the action, the client application will automatically display the selected screen monitoring device.

9.3.2.5 Show a SCADA screen

This action can only be done on the client application. In conducting the action, the client application will automatically display the selected SCADA screen. Only in SCADA en Deluxe versions.

9.3.2.6 Show a report

This action can only be done on the client application. In conducting the action, the client application will automatically display the selected report. Only in SCADA and Deluxe versions.

9.3.2.7 Sound Alarm

This action can only be done on the client application. On conducting the action, the application will emit a bleep.

9.4 Event Variables[5]

Each of the events has an associated series of variables that can be used in SCADA screens, reports, graphs and tables.

Using these variables it is possible, for example, to know the status of the event on a SCADA screen, or the number of activations of the event in a report.

The number of variables associated with each event may vary depending on whether the event is reported or is stored in the event log.

The event variables are coded for use in formulas and expressions such as

R$EVE_variable. name

Using the *R$EVE* prefix tells the program that this is an event variable rather than a device variable.

This coding can be used in formulas, graphs and tables, although in the case of reports, graphs and tables only the variables of those events that are recorded on file can be displayed.

[5] Only in SCADA and Deluxe versions

10 Appendices

10.1 Expressions and conditions

Many parts of the program allow the inclusion of terms or conditions. To enter these there is a standard text control available accompanied by a help button that will guide you through editing them.

Real numbers can be used in an expression or condition (in accordance with the IEEE 754-1985 standard, where among other aspects, it stipulates that the decimal separator is the "**.**") symbol, parentheses ("**(**" and "**)**"), addition operators ("**+**"), subtraction operators ("**-**"), multiplication operators ("***"), division operators ("*/*") and exponential operators ("**^**"). Thus, some valid examples would be:

```
2*(4.56^2)
1-(2.12-4)/2
```

The following mathematical functions can also be used:

`sqrt(exp)`: Square root of the expression "*exp*
`log(exp)`: Natural logarithm of the expression "*exp*
`exp(exp)`: Number "*e*" to the power of expression "*exp*"
`sin(exp)`: Sine of the expression "*exp*" (in radians)
`cos(exp)`: Cosine of the expression "*exp*" (in radians)
`tan(exp)`: Tangent of the expression "*exp*" (in radians)
`asin(exp)`: Arcsine of the expression "exp"
`acos(exp)`: Arccosine of the expression "*exp*" (in radians)
`atan(exp)`: Arctangent of the expression "*exp*"
`atan2(exp1, exp2)`: Extended arctangent of the expression "*exp1/exp2*"
`log10(exp)`: Base 10 logarithm of the expression "*exp*
`round(exp)`: Rounding off to whole number nearest to the expression "*exp*"
`trunc(exp)`: Truncation to the whole number of the expression "*exp*"
pi() : Returns the number PI (3.1415927…).
e() : Returns the number E (2.7182818…).
`mod(exp1, exp2):` Return the modulus "exp2" of expression "exp1
`max(exp1, exp2):` Returns the maximum of the two expressions
`min(exp1, exp2):` Return the minimum of the two expressions
`abs(exp):` Returns the absolute value of the expression "*exp*"
`rand():` Returns a real random value between 0.0 and 1.0
`if(cond, exp1, exp2):` Evaluates the condition "*cond*". If the condition is true it returns the expression "*exp1*" if false it returns the expression "*exp2*
`bit(exp1, exp2):` Returns the value of the positioning bit "*exp2*" for the number "*exp1*".
`setbit(exp1, exp2, exp3):` Returns the value obtained by placing the positioning bit "*exp2*" the value "*exp3*" to the number "*exp1*".
`normalize(exp1, exp2):` Returns "*exp1*" if "*exp1*" can be evaluated, otherwise it returns "*exp2*".

We should remember some details about these functions. The square root function will return an error if the expression is negative. The logarithmic functions ("***log***" and "***log10***")will return and error if the expression is less than or equal to zero. The Arctangent function ("***atan***") assesses a range that goes from -π/2 to π/2 and returns zero if the expression is zero. The extended Arctangent function ("***atan2***") assesses a range that goes from –π to π and returns zero if both expressions are zero. The Arcsine functions ("***asin***"), Arccosine ("***acos***"), Arctangent ("***atan***") and extended Arctangent ("***atan2***") return the result in radiants. The functions that return the number pi ("***pi***") and e ("***e***") have no parameters, so they can be used with or without parentheses. The functions are not case sensitive. Examples of valid formulas are:

```
2*pi()-sqrt(10)
round(exp(2)+atan2(1.2)-e*pi)
```

It is also possible to use certain time functions:

`sunrise(exp1, exp2)`: Returns the number of hours from 00:00 hours until sunrise, the longitude being expression "*exp1*" and the latitude expression "*exp2*". Parameters "*exp1*" and "*exp2*" are in degrees.

`sunset(exp1, exp2)`: Returns the number of hours from 00:00 hours until sunset, the longitude being expression "*exp1*" and the latitude expression "*exp2*". Parameters "*exp1*" and "*exp2*" are in degrees.

`sunrisehours(exp1, exp2)`: Returns the time of the sunrise, the longitude being expression "*exp1*" and the longitude expression "*exp2*". Parameters "*exp1*" and "*exp2*" are in degrees.

`sunriseminutes(exp1, exp2)`: Returns the minute of the sunrise, the longitude being expression "*exp1*" and the longitude expression "*exp2*". Parameters "*exp1*" and "*exp2*" are in degrees.

`sunriseseconds(exp1, exp2)`: Returns the second of the sunrise, the longitude being expression "*exp1*" and the longitude expression "*exp2*". Parameters "*exp1*" and "*exp2*" are in degrees.

`sunsethours(exp1, exp2)`: Returns the time of the sunset, the longitude being expression "*exp1*" and the longitude expression "*exp2*". Parameters "*exp1*" and "*exp2*" are in degrees.

`sunsetminutes(exp1, exp2)`: Returns the minute of the sunset, the longitude being expression "*exp1*" and the longitude expression "*exp2*". Parameters "*exp1*" and "*exp2*" are in degrees.

`sunsetseconds(exp1, exp2)`: Returns the second of the sunset, the longitude being expression "*exp1*" and the longitude expression "*exp2*". Parameters "*exp1*" and "*exp2*" are in degrees.

`sunshinehours(exp1, exp2)`: Returns the number of hours between the sunrise and the sunset, the longitude being expression "*exp1*" and the longitude expression "*exp2*". Parameters "*exp1*" and "*exp2*" are in degrees.

`sunshineminutes(exp1, exp2)`: Returns the number of minutes between the sunrise and the sunset, the longitude being expression "*exp1*" and the longitude expression "*exp2*". Parameters "*exp1*" and "*exp2*" are in degrees.

`sunshineseconds(exp1, exp2)`: Returns the number of seconds between the sunrise and the sunset, the longitude being expression "*exp1*" and the longitude expression "*exp2*". Parameters "*exp1*" and "*exp2*" are in degrees.

getsecond(`exp`): Returns the second of the date "*exp*".
getminute(`exp`): Returns the minute of the date "*exp*".
gethour(`exp`): Returns the hour of the date "*exp*".
getday(`exp`): Returns the day of the date"*exp*".
getmonth(`exp`): Returns the month of the date "*exp*".
getYear(`exp`): Returns the year of the date "*exp*".

second() : Returns the second of the current date.
minute() : Returns the minute of the current date.
hour() : Returns the hour of the current date.
day() : Returns the day of the current date.
month(): Returns the month of the current date.
year() : Returns the year of the current date.

These functions return values relating to the date in the local time of the engine when viewed from the client, and values relating to the local date of the editor when editing a SCADA screen or report. The functions that do not contain parameters can be used with or without brackets. The "***second***" function returns a value between 0 and 59, like the "***minute***" function. The "***hour***" function returns a value between 0 and 23. The "***day***" functions returns a value between 1 and 31. The "***month***" function returns a value between 1 and 12.

The following time functions are only available in reports.

secondsinperiod(): Returns the number of seconds in the current period of the report
minutesinperiod (): Returns the number of minutes in the current period of the report
hoursinperiod (): Returns the number of hours in the current period of the report
daysinperiod (): Returns the number of days in the current period of the report

beginsecond (): Returns the initial second in the actual period of the current report
beginminute (): Returns the initial minute in the current period of the report
beginhour (): Returns the initial hour in the current period of the report
beginday(): Returns the initial day in the current period of the report
beginmonth(): Returns the initial month in the current period of the report
beginyear(): Returns the initial year in the current period of the report
endsecond(): Returns the final second in the current period of the report
endminute(): Returns the final minute in the current period of the report
endhour(): Returns the final hour in the current period of the report
endday(): Returns the final day in the current period of the report
endmonth(): Returns the final month in the current period of the report
endyear(): Returns the final year in the current period of the report

Both for the expressions and the conditions reference can be made to device variables added to the system. To make reference to one of these variables its name must be entered between the square brackets ("**[**" and "**]**"). The name of a device consists of two parts separated by a period ("**.**") the left side is the name of the device and the right side is the variable code of the device (to consult variable codes allowed consult the corresponding appendix for each device). Some examples are:

```
2*[CVM144.VI1]
[CVM K 1.AE]+[CVM K 2.AE]+[CVM K 3.AE]
```

In some parts of the program it is possible to apply a filter to the variable that is, to see the value of the filtered variable in accordance with a calendar. This is possible, for example, in reports or graphs and only in some specific variables, such energy variables.

In order to refer to the filtration of a variable we should indicate to the left of the variable, the name of filter plus the extension. **XDCT** " followed by "**@**"and the type of hour we want to access. For example, if we have defined a filter with the name "*Rate*" that contains two types of hours "*H1* and *H2*," we can refer to both as follows:

```
[Tarifa.XDCT@H1:CVMK.AE]
[Tarifa.XDCT@H2:CVMK.AE]
```

It should be emphasized that after the name of the rate we should always find the "**.XDCT**," extensions followed by "**@**", the name of the type of hour and the symbol "**:**". Remember that not all variables of the devices can be filtered; see the variables code appendix for details on which variables of each device can be filtered.

In some parts of the program, such as in the reports and the SCADA screens, you can also refer to variables previously defined in the formula list. Both in the reports and in the SCADA screens there is a list of expressions each identified by a text that, can be used in controlling formulas or in the conditional control. So, an expression with the identifier "*F1*", be used in other expressions:

```
F1*2.0-1.3
1-sqrt (F1)
```

It should be emphasized that the identifier of an expression (name of the variable) cannot start with a numerical digit, although it may contain them.

Finally, in those places where a condition is required, it is possible to use the operators less than ("**<**"), greater than ("**>**"), less than or equal to ("**<=**"), greater than or equal to ("**>=**"), equal to ("**==**"), different to ("**!=**"), logical "AND" ("**&&**"), logical "OR" ("**||**") and logical "NOT" ("**!**").

Remember that the comparison operators require the terms to the left and right be numerical, while the logical operators require expressions to be conditions. Thus, examples of correct conditions would include:

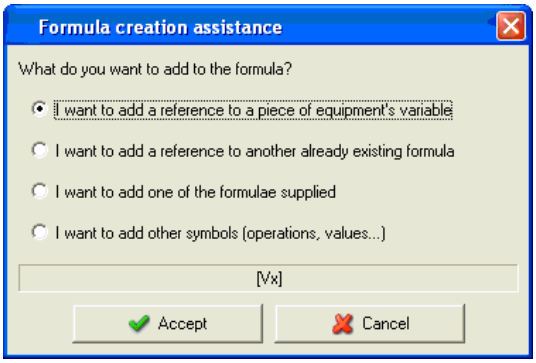
```
[CVMK.VI1]>(240-F1)
(F1!=10 && [CVMK.VI3]<=20)
```

Expressions and variables are always of the numerical type (real) while the conditions are the Boolean type.

10.1.1 Expressions and Conditions Creation Wizard

PowerStudio has an assistant, or wizard, for creating conditions and expressions. This wizard can be accessed by clicking the button, which is next to the text controls where we can manually enter the terms and conditions.

Clicking on this button will bring up the following window:

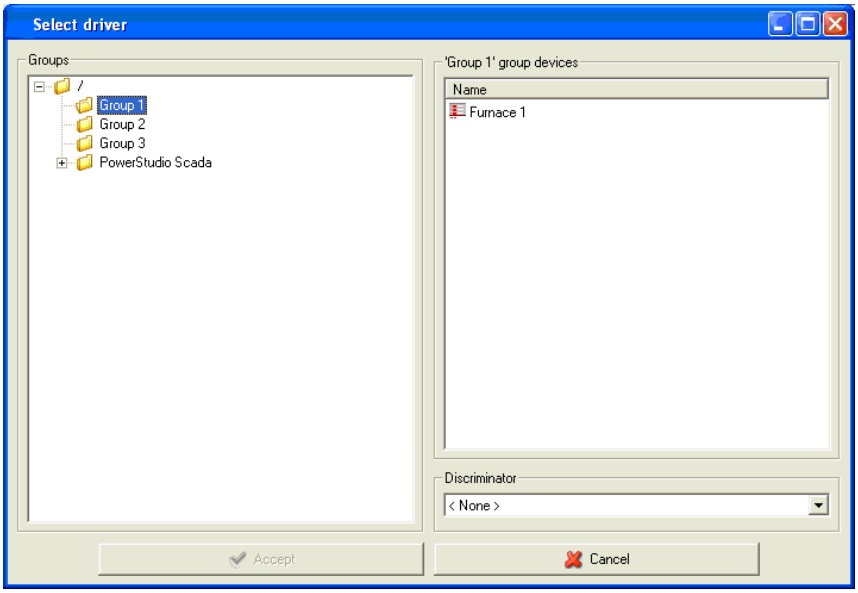

Formula creation assistance
What do you want to add to the formula?
I want to add a reference to a piece of equipment's variable
I want to add a reference to another already existing formula
I want to add one of the formulae supplied
I want to add other symbols (operations, values...)
[Vx]
Accept
Cancel

Here you may select what you wish to add to the expression. The option will be added in the position of the cursor in the text control associated to the expression. The lower part of the dialogue shows where to enter what you want to add:

- [Vx]. If we want to add a reference to a variable of a unit
- Fx. If you want to add a reference to another already defined formula
- F (x). If you want to add one of the functions provided
- x. If you want to add other symbols.

The wizard options are as follows:

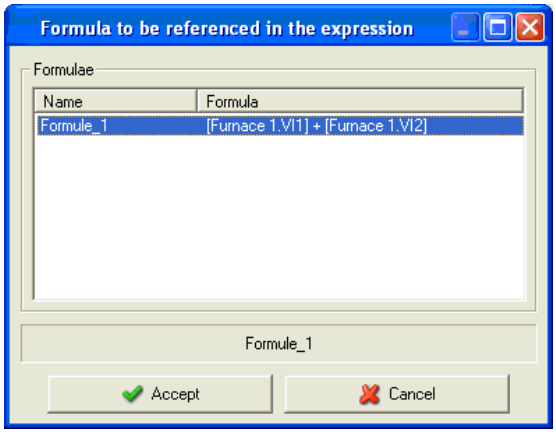
- *Add a reference to a variable of a device:* Selecting this option will display a window where you can choose the device from which to add a variable to the formula.



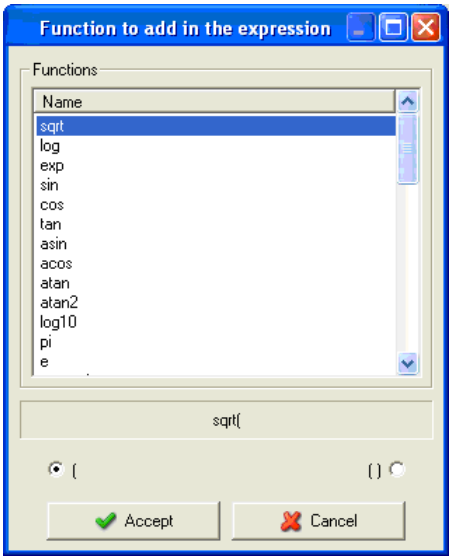
Likewise, you may specify a previously defined specific filter (see chapter 3) using the control:

Once you have chosen the unit and the filter (where appropriate) the variables selection window will be displayed allowing you to choose the variable to be entered in the formula (see 3 Variable selection)

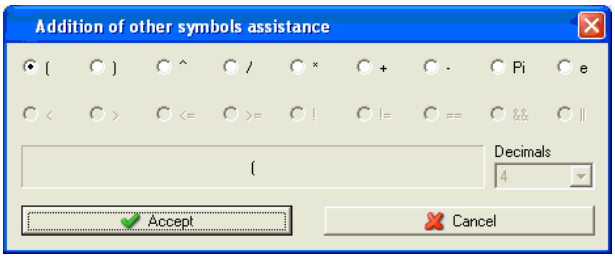
- *Add a reference to an already defined formula:* This option enables you to enter a reference to another previously defined formula. This option is only available in reports and SCADA screens. Selecting this option will display a window where a previously defined formula can be selected:



- *Add one of the functions provided:* This option allows access to a list of typical mathematical functions which can be entered into the formula being edited:



- *Add other symbols:* this option allows you to enter symbols such as comparators, logical functions, basic symbols, specific mathematical numbers, and so on.



Depending on whether what you are creating corresponds to an expression or a condition, some of these symbols will be disabled and therefore may not be selected.

Technical Service

For questions, contact CIRCUTOR's Technical Service or your nearest CIRCUTOR distributor.

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